306.8
Am3

LIBRARY
RECEIVED
MAY 6 - 1937
U.S. Department of Agriculture

AMERICAN
DYESTUFF REPORTER
DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
BLEACHING ◆ DYEING ◆ FINISHING ◆ PRINTING

VOLUME 26 MAY 3, 1937 NUMBER 9

Du Pont has just developed a new dyestuff suitable for application on various types of acetate fibers. Known as Celanthrene Green BS, it will be of considerable interest to the dyer of acetate fiber satins, taffetas, knit-goods and combination fiber crepes. It is a homogeneous product yielding bluish shades of green, and when combined with Acetamine* Yellow 5G an interesting range of bright greens may be obtained. Celanthrene Green BS is readily dispersible and possesses generally satisfactory fastness properties, being very resistant to both dry cleaning and perspiration. It is carefully controlled during manufacture; thus, the user can be assured of uniform quality at all times.

*Trade Mark Reg. U. S. Pat. Off.

E. I. DU PONT DE NEMOURS & COMPANY, INC.
ORGANIC CHEMICALS DEPT., DYESTUFFS DIVISION, WILMINGTON, DELAWARE

DU PONT DYESTUFFS
REG. U.S. PAT. OFF.

OFFICIAL PUBLICATION OF THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

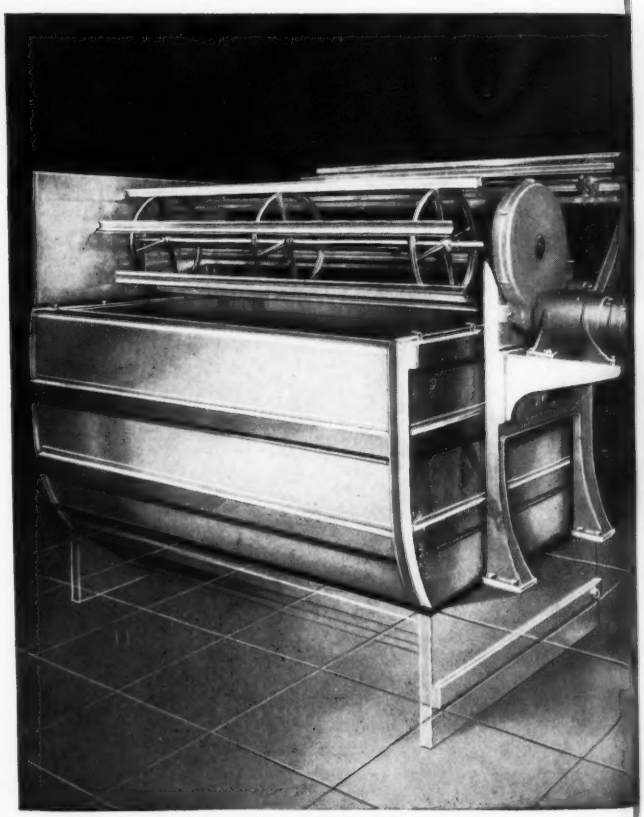
STAINLESS STEEL DYE BECK—
SHALLOW TUB CONSTRUCTION

Self supporting—stainless steel reels. May be equipped with unloading device if desired. Individual motor drive—gear type. Machine equipped with idler reel.

THROUGH intensive research we have perfected a method of welding and fabricating this popular metal and can furnish drying cylinders—dyeing machines (all metal or with lined tanks)—or special machines made to your order.

Put any problem pertaining to stainless steel equipment for the Dyer or Finisher up to us.

Remember: We make the complete line of **KLAUDER WELDON DYEING MACHINERY** and can furnish parts for any KLAUDER WELDON Machine



STAINLESS STEEL PIECE DYE KETTLE
—DEEP TUB CONSTRUCTION

Tub is self supporting type and sets on foundation below floor level. Individual motor drive—gear type. Machine is equipped with idler reel and an unloading device with automatic stop motion.

H. W. BUTTERWORTH & SONS CO.
PHILADELPHIA, PA.
Established 1820
PLANTS at PHILADELPHIA and BETHAYRES, PA.

New England Office:	Southern Office:	In Canada:
TURK'S HEAD BUILDING	JOHNSTON BUILDING	W. J. WESTAWAY CO.
Providence, R. I.	Charlotte, N. C.	Hamilton, Ontario

BUTTERWORTH *finishing* MACHINERY

COMPLETE LINE OF FINISHING AND RAYON MACHINERY FOR THE TEXTILE INDUSTRY

A. P. HOWES
Publisher

M. D. REESER
Advertising Manager

AMERICAN DYESTUFF REPORTER

LOUIS A. OLNEY
Directing Editor

NORMAN A. JOHNSON
Managing Editor

Copyrighted 1937 by Howes Publishing Co.

DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY • BLEACHING • DYEING • FINISHING • PRINTING • AND THE NECESSARY MECHANICAL EQUIPMENT

"Circulated Everywhere Textiles Are Processed"

Subscription Price: $5.00 per year; Canadian, $6.00; Foreign, $6.00. Fifty cents per copy

VOLUME 26 | MAY 3, 1937 | NUMBER 9

CONTENTS OF THIS ISSUE

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

General

A New Solution to the Problem of Making Wool Unshrinkable 239
The Finishing of Printed Fabrics 241
Preparing Silks for Printing 243
J. M. Hill
New Ways of Testing Woolen and Worsted Lubricants 246
Werner von Bergen
Book Review 255
Technical Notes from Foreign Sources 260
Trade Notes—New Products 261
Open Forum 264

Proceedings of American Association of Textile Chemists and Colorists

Calendar of Coming Events P247
Manufacture and Properties of Spun Rayon P248
F. Bonnet
Meeting, Northern New England Section P253
Corrections Re Membership Applications P253
Unemployment Register P254

Editorial:

Another Successful Show 255

Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

Published Every Other Monday

HOWES PUBLISHING CO. ~ ~ 440 FOURTH AVE. ~ ~ NEW YORK

CLOSING DATE FOR ADVERTISING COPY . MONDAY PRECEDING ISSUANCE DATE

NATIONAL CARBANTHRENE

PRINTING POWDERS

BRILLIANT · UNIFORM · FAST

For unequaled penetration, sharper prints and better color value in fine lines, scroll work and stipple effects use NATIONAL (Instantly Dispersable) CARBANTHRENE PRINTING POWDERS, the vat color types that remain unchanged in storage thus assuring consistent uniformity on repeats.

NATIONAL ANILINE & CHEMICAL COMPANY, Inc.
40 RECTOR STREET **NEW YORK, N. Y.**

BOSTON	150 Causeway St.	CHARLOTTE	201-203 W. First St.
PROVIDENCE	15 Westminster St.	GREENSBORO	Jefferson Standard Bldg.
CHICAGO	357 W. Erie St.	ATLANTA	140 Peachtree St.
PHILADELPHIA	200-204 S. Front St.	CHATTANOOGA	James Bldg.
SAN FRANCISCO	517 Howard St.	PORTLAND, ORE.	646 N. Thompson St.
	TOROTO 137-145 Wellington St. West		

Branches and Distributors throughout the World

NATIONAL N DYES

AMERICAN
DYESTUFF REPORTER

VOLUME 26 MAY 3, 1937 NUMBER 9

A New Solution to the Problem of

Making Wool Unshrinkable

Specially Contributed

ONE of the interesting recent discoveries in connection with the treatment of wool is that described by A. J. Hall, in a recent lecture in Manchester entitled—"A new nonchlorine treatment for making wool unshrinkable." It appears that whereas hitherto the use of active chlorine in one form or other has been thought essential to any wool treatment for the purpose of eliminating its felting properties, the discovery has now been made that quite a different yet simple treatment is equally effective while avoiding the disadvantage of damaging the wool itself. The new treatment appears to solve the problem which has puzzled wool finishers for many years—the making of wool unshrinkable without reducing its durability.

In treating wool by the new process use is made of sulfuryl chloride. This is a liquid related to sulfuric and hydrochloric acids in so far as it readily hydrolyzes to form these acids when shaken with water. It does not mix with water but forms a lower layer when poured into it. In contrast, sulfuryl chloride is readily soluble in a number of organic solvents and most important among these is white spirit—the solvent which is very widely used in the dry cleaning of textile materials. It is a solution of sulfuryl chloride in white spirit which is said to be found most suitable for applying to wool for making it unshrinkable.

The large scale process as described by Mr. Hall is carried out by immersing the air dry wool goods in a 1 to 2 per cent solution (by volume) of sulfuryl chloride in white spirit at room temperature for about one hour. In the case of fabric the ratio of liquor/wool is usually about 6, whereas for yarn it is about 12; the reason for this difference in treatment is that the yarn is more bulky than fabric. During this period the sulfuryl chloride reacts with the moisture in the wool with formation of sulfuric and hydrochloric acids according to the following equation:

$$\underset{\text{Sulfuryl chloride}}{SO_2Cl_2} + \underset{\text{Water}}{2H_2O} = \underset{\text{Sulfuric acid}}{H_2SO_4} + \underset{\text{Hydrochloric acid}}{2HCl}$$

Apparently in the formation of these acids the properties of each wool fiber are affected to the extent that they do not afterwards felt when rubbed together in a soapy liquor.

Although the amount of moisture in air dry wool is sufficient to hydrolyze all the sulfuryl chloride thus applied, only about 50 per cent of that used is actually hydrolyzed. The remaining 50 per cent is left unchanged in the white spirit solution. Consequently when the wool is afterwards hydroextracted and the liquor collected it is possible to add about one-half of the original amount of sulfuryl chloride to it and use it again in the process. Mr. Hall stated that in a large scale plant the same white spirit solution had been in use for about one year and it was quite satisfactory. In the event of a thorough purification being necessary the liquor would be neutralized with alkali and distilled.

One of the most interesting features of the new process is that it is applied to wool in its air dry state. Obviously it is in this condition that the white spirit solution can penetrate the wool very rapidly and perfectly so that the sulfuryl chloride comes in contact with every fiber so that the unshrinkable finish is a very thorough one. Also, the treatment can be applied to wool materials without a preliminary scouring or other purifying treatment. White spirit can penetrate oily wool just as freely as scoured wool. Thus the treatment is suitable for loose greasy wool, wool tops in oil, and freshly spun yarn or woven or knitted fabric. In practice it is found that the natural oils present in the wool do not complicate the sulfuryl chloride treatment in any way. As a matter of fact the treatment facilitates subsequent scouring in so far as it disperses the oils present.

No special drying of the wool is necessary. It is sufficient that it be dried and left in contact with the surrounding air for a short time so that its moisture content be-

comes reasonably uniform. As showing how the original moisture content of the wool influences the process, Mr. Hall quoted the results of some experiments especially designed to give information on this point.

Some samples of wool fabric were conditioned for a few days while suspended over sulfuric acid of various concentrations which corresponded to different degrees of humidity. The fabrics were then treated with sulfuryl chloride and their resistance to shrinkage afterwards determined by hand washing them together in a warm soap liquor. It is considered better to wash by hand rather than to mill the fabrics in a machine because the treatment approximates more closely to the kind of treatment to which wool garments are ordinarily subjected when in everyday use. The following results were obtained:

Humidity of air surrounding wool fabric	*Shrinkage in washing*
0%	22%
1	22
5	21
13	24
21	21
33	22
49	7
62	4
71	4
83	2
100	4
Untreated fabric	36

The significance of these results is more clearly illustrated in Fig. 1. It appears that bone dry wool is much less responsive to the sulfuryl chloride treatment than is normal air dry or damp wool. On the whole, however, it is found that if the dry wool is left lying in contact with air for a few hours it is in a satisfactory state for treatment.

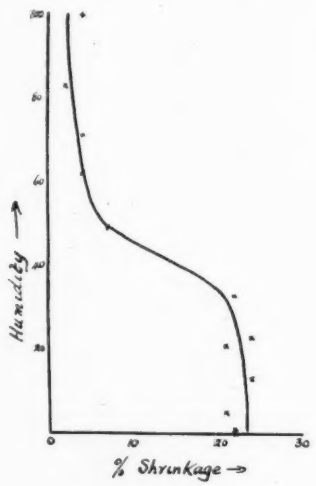


Fig. 1.

In contrast to these wide limits as regards dryness for the sulfuryl chloride process it may be pointed out that in producing unshrinkability by the chlorine gas treatment it is most important that the wool shall be dried so that it contains not more than about 8 to 9 per cent of moisture. Ordinary air dried wool contains about 16 per cent of moisture so that it can be seen the gas process involves special drying and care that the moisture content of 9 per cent is not exceeded. Much interesting information concerning the behavior of wool to chlorine gas can be found in E. P. 11917 of 1897. If the gas is applied to normal air dry wool then there is grave risk of the wool being much damaged and given a harsh handle.

When wool in its air dry condition is treated by the new unshrinkable process it is a fortunate result that the handle of the wool is by no means impaired. The treated wool has its original softness and fullness of handle. This is a most important feature of the process for it allows the treatment of yarn so that it can afterwards be knitted up into underwear and other garments having the softness which is necessary for this class of goods.

In connection with the manufacture of wool knitted garments it is important that the color of the wool should not be affected if this is already dyed. All the work so far done with the process indicates that most wool dyes are not appreciably affected and the dyed wool retains its original shade and depth of shade. But it is to be anticipated that a number of dyes will be affected on account of their general lack of fastness. So in applying the new process to dyed wool goods it will at first be necessary to make a preliminary trial to ascertain how far the color is affected. In general, however, it is believed that little difficulty will be experienced in this connection for it is to be remembered that the unshrinkable treatment is essentially an acid treatment of the wool and most wool dyes are fast to mineral acids.

Another important point is that it is claimed that the process does not affect the strength of cotton and rayon fibers which may be present with the wool. In these days when viscose staple fiber is being intimately mixed with wool with a view to securing cheaper and more novel effects it is important that the unshrinkable process not decrease the tensile strength or durability of such fibers. Careful experiments have shown that provided the cotton or viscose rayon is not excessively damp these fibers retain their original durability. These results have been obtained by measuring the cuprammonium fluidity of the cellulose fiber before and after treatment with wool in the sulfuryl chloride process and it has been observed that the fluidity has not been raised more than about one degree. Also on the large scale wool materials having rayon and cotton stitchings have been processed with complete satisfaction. Under these circumstances it is easy to see that the process will have wide application in the treatment of mixture wool goods.

It is also fortunate that the sulfuryl chloride treatment does not affect the shade of many direct cotton dyes which are susceptible to change when treated with the usual chlorine unshrinkable process. If the direct cotton dyes

will withstand treatment with sulfuric and hydrochloric acid then they are likely to withstand satisfactorily the new unshrinkable process with sulfuryl chloride since as previously mentioned this decomposes during the process into sulfuric and hydrochloric acids. Here again this peculiarity of the new process makes it easier to deal with mixture wool goods containing dyed cotton or viscose rayon materials.

In the course of his lecture Mr. Hall noted the behavior of a few direct cotton dyes as present on cotton towards the new sulfuryl chloride process and the usual chlorine method (treatment of the wool with an acidified solution of sodium hypochlorite). Some of the dyes mentioned are included in the table below:

	Color of cotton after treatment with:	
Dye	*Sulfuryl chloride*	*Chlorine*
Diphenyl Red 7BL	Unchanged	Pink
Sky Blue FF	Unchanged	Cream
Diphenyl Yellow C4GL	Unchanged	White
Direct Scarlet 4BS	Slightly paler	Cream
Chlorazol Orange RS	Unchanged	Pale cream
Formic Black C	Unchanged	Light brown

Turning now to the effect of the process on the individual fibers Mr. Hall observed that microscopical examination revealed that practically no change could be seen. The scales were left apparently unaltered while the fiber retained its original length and diameter. Perhaps it was because the scales were unchanged that the wool was unappreciably affected in handle and durability and possibly the same cause accounted for only a very slight increase of luster. In treating wool with the chlorine unshrinkable process there is a luster increase and this is commonly attributed to the fact that a proportion of the epithelial scales are removed so that the fibers become more glass-like. While this luster increase may be accepable it is accompanied by the serious disadvantage of leaving the wool harsher in handle and less durable.

The fact that the epithelial scales are left unchanged also accounts for the observed fact that the wool treated with sulfuryl chloride does not acquire a markedly increased affinity for acid dyes—chlorinated wool absorbs these dyes much more readily and it will be remembered that in printing wool it is frequently desirable to prechlorinate for the purpose of making the wool more receptive to the dyes applied.

Mr. Hall observed that careful trials between fabrics treated by the sulfuryl chloride and the chlorine processes had shown that in washing for prolonged periods the sulfuryl chloride treated wool showed itself much more durable. This was considered a most important advantage since it implied that the public would ultimately benefit by being able to purchase unshrinkable wool goods having a much better durability than those now available. The absence of damage by the new process would also allow wool finishers to carry the treatment right up to the point where the wool was left unshrinkable. At the present time most finishers left the wool somewhat shrinkable for fear of damaging it in applying a strength of chlorine which it was known to be necessary to produce full unshrinkability.

The new process has now progressed beyond the experimental stage. A large scale demonstration plant is in use at the works of Messrs. Adams & Co. of Nottingham (the patentees) and the process is now being licensed on a royalty basis to all wool firms who were interested. Among those firms already granted licenses were Messrs. McCallums Ltd. of Paisley, Messrs. Wolsey Ltd. of Leicester, Messrs. The Springfield Hosiery Co. Ltd. of Nottingham, Messrs. Turnbulls Ltd. of Hawick, and Messrs. H. Fletcher & Co. Ltd. of Halifax. These firms are installing the necessary plant for treating wool in the form of yarn, fabric, and slubbing. Other important firms are interested in the process with a view to acquiring licenses.

—♦♦—

The Finishing of Printed Fabrics*

FABRICS printed in the ordinary way, before finishing, have different properties and appearance from those of dyed fabrics. In the first place printed fabrics before finishing are usually stiffer than the same fabrics piece-dyed, because of the residual gum that subsequent washings have not been able to get rid of completely, owing to the risk of printing off or reducing the brightness of the colors, or bleeding on the white or lighter colors of the designs.

In the second place it is not possible to apply the same treatment to the same quality of fabric, owing to the print designs covering more or less amounts of the surface. Different combinations of colors and design tend to make a difference to the feel, and the method of printing has an influence on the handle of the fabric. Discharge styles are softer than normal printing, which again gives a softer fabric than printing with pigments. Finally the design containing metallic powders has a tendency to be stiffer than any other style.

Moreover, a printed fabric is generally thinner and rather wider than a dyed piece. This is usually due to the tension necessary before the printing process. Ageing and drying used to fix the colors have a tendency to make

* Textile Manufacturer.

the fabric retain the width throughout the subsequent processes of finishing. The absence of sufficient shrinkage or crepe figure is a serious fault in many printed fabrics and is a problem for the finisher. It is almost impossible to get over the trouble, though certain finishers claim that it is only necessary to pass the fabric through wet steam to allow it to pull in. Other finishers try to bring the texture by damping the fabric on a blanket and then drying it without tension.

Sometimes the numerous faults in printed fabrics are put down to a particular filling or finish and yet they are not seen in dyed fabrics submitted to the same processes. Powdering is a fault which frequently does not appear before calendering. This powdery appearance is caused by the use of too much pigment or an insufficient quantity of fixing agent (egg albumen) in the printing paste.

Another fault peculiar to metallic printing is crease marking. This only shows when the fabric is stretched. The fabric has a crushed appearance where there is a metallic figure; cellulose liquor (usually cellulose acetate) used to fix metallic powders, fixes the warp and the spot so that any pressure crumples the fabric at these places. Another fault which is often present is the uneven feel of the fabric. The printed portion can be readily distinguished. The fault might be avoided by calendering, followed by fabric breaking, but mostly it is necessary to restore the fabric by washing. Even this does not improve certain printed designs.

Several faults in printing are caused or enhanced by the finishing treatment. Printing-off is a fault which sometimes occurs during dressing, particularly when the printed fabric is left damp and in contact with other parts of the same fabric during drying. It can also be caused when the design is picked up by damp rollers and passed on.

It is necessary to speed up the dressing process as much as possible in order to prevent printing-off. Unfortunately poor penetration of the finishing may result owing to the high temperature necessary for the increased speed. However, a piece weakly finished can be washed and finished again, whereas a piece marked off is spoilt.

Many kinds of fabrics are centrifuged after leaving the washer. The hydro-extracted pieces ought to be opened in width and dried as soon as possible to avoid printing off. It is advisable to prolong the hydro-extracting a few minutes so that the fabric may leave the centrifugal as dry as possible.

Printing-off can be caused by using too much oil in the finishing mixture, because excess of oil may re-dissolve many dyestuffs and the color is applied on other parts of the pieces or on the roller of the finishing bath.

Similarly printing-off can happen in finishing if, after light steaming, the pieces are not first carefully dried.

Pigment prints have a tendency to print-off on to the dark grounds now popular on combinations of navy blue or black with small white spots. This kind of printing-off or powdering can be prevented by passing the fabric over a rubbing machine which removes the excess pigment which might be fixed on during finishing.

Some colors have a tendency to run when they come into contact with penetrating agents, which consequently ought not to be used in the finishing composition, even though the feel may suffer somewhat.

Drying too slowly may spoil the pieces because it causes spotting of the white parts.

The finishing mixtures used for printed fabrics are different from those used for dyed fabrics, the remains of the printing paste necessitating the use of more oil and less wetting material.

A water proofing finish prevents colors from running and printing off. When they are once dry there is an advantage that they resist wetting. Some works use them for this reason.

Powdered finishes are also used more on printing tissues than on dyed. These powdered finishes do not give rise so easily to printing-off as those applied from a bath; many prints very quickly color the finishing size through which they pass.

It is not always easy to give as soft a handle as a customer would like, especially when using a paste containing pigments. In the latter case the fabric is calendered before the finishing is applied; and then again sometimes the fabric is broken on the stud-machine instead of being calendered before receiving the finish. In this way softness can be obtained without using too much oil. Often a high proportion of oil will not soften the material but will make the fabric soft in feel. It can also become rancid during storage and cause bleeding and printing-off.

There are very few prints which need to be passed through the rubbing machine, except those with small spots on very dark grounds which have been dyed in the piece and those which have excessive quantities of pigment or insufficient fixing agent for the pigment. The rubbing helps to obtain a softer touch on pigment prints because the action of the machine breaks the fabric and softens it.

WATERPROOFING FOR FINISHING

Metallic prints require an extra process above that of other prints. The object is to remove the folding caused by the finish used to fix the metallic powder. The effect can be removed by making the fabric follow a serpentine path, or it can be done by hand. Breaking in the stud-machine cannot be done successfully.

When large surfaces are printed with metallic powders it is often impossible to prevent distortion when the fabric is stiffened in finishing.

The finishes used on printed silk fabrics are rather different from those used on dyed pieces. The waterproof finish has several advantages, but it should be permeable to air. One such finish is made with emulsified paraffin and aluminium acetate. Another formula is paraffin 88 parts, stearic acid 9 parts, triethanolamine 3 parts, water 300 parts, in finishing dyed pieces.

Where such finished fabrics remain several hours after finishing and before being dried, no harm is done to the handle of the fabric, but partial drying should be avoided by covering the pile with a wet fabric. Otherwise it may produce light and dark spots. Printed fabrics finished in this way should not be left in a wet state on rollers owing to the risk of discharging the color, and the drier should be attached to the delivery of the finisher. The second method of applying proof finishes consists in using two large padding mangles. The fabric passes first through a pad, which contains aluminium acetate and then after a run through air it passes through a wax emulsion pad and is dried at once. The third method, not much used, consists in passing the fabric through a vat containing aluminium acetate and then through a hot chamber for drying. The fabric is then passed through a vat containing emulsion and dried a second time.

One difficulty is that the emulsion sometimes breaks into small particles and forms a cream on the surface. It is then necessary to empty the machine—otherwise it will form spots which will be difficult to remove.

The bath can be stabilized by the addition of 3 per cent gelatine, but too much gelatine would stiffen the fabric.

Before proofing, it is necessary to see that the fabric contains neither soap nor oil, as these substances tend to emulsify wax and produce spots. One trouble with proofing finishes is the change of shade of certain colors, which can be avoided by a choice of the dye-stuffs.

For a good proof finish the fabric ought to be well impregnated with the finishing liquor. The usual speed is 14—40 yds. per minute. The speed should be reduced for heavy Canton crepes and increased for lighter fabric.

Delustering agents are less used on prints than on dyed fabrics because they harden the fabric. Certain delustering agents are, however, used on wet silk prints. The printed parts become harsher than the grounds. The addition of a dulling agent in a small quantity of the finish seems to cover the metallic luster of the ground and the fabric sells better.

PREPARATION OF SILKS FOR PRINTING

Silk pieces need to be prepared before being printed. For good print they should have an even weight and a flat and uniform surface. Fabrics which have been scoured or dyed or been passed through any wet process are not usually free from crease marks and unless they have been dried on the stenter the width is often irregular. Consequently, fabrics for printing are usually put on a roller or are stentered. The width before printing depends on the weave and the final appearance required. Fabrics heavily creped are usually widened by 5—8 in. above their final width in order to give a flat surface. The crepe surface will distort most designs too much.

Finished materials for prints are similar to those for piece-dyed goods. Some printing works have a washer fitted to the drying center and in such cases a hydro-exhauster is usually fitted between the washer and the dryer. Some washers are similarly attached to a drying chamber. It is better to dry satins, organdies and such fabrics on a stenter after washing, to avoid crease marks which are difficult to remove.

Generally, fabrics dealt with in open width after dyeing should be washed in open width. The others can be washed by any method.

Some styles of design do not allow the use of a finishing pad, neither do silk dress goods or big block prints. This kind of fabric might be finished by a beater in combination with a stenter and a drying chamber or might be passed through a trough following which is an exhauster and then a stenter. These methods would avoid printing-off. Proofed fabrics tend to become electrified during drying. A fabric, however, dried too much in the chamber is sometimes attracted to the walls.

—— ♦ ♦ ——

Preparing Silks for Printing*

J. M. HILL

SILK as a fabric has many outstanding qualities foremost of which is that of its wearing property. A silk filament has three times the tensile strength of a similar filament of linen and twice the tensile strength of jute. In fact, a silk filament which varies in diameter from 0.013 to 0.25 mm. has approximately the same strength as a similar filament of iron.

Prints on silk have always had an appeal peculiarly their own, the colors having a soft brilliance which it is hardly possible to duplicate on any other fabric. In printing as in dyeing, the first essential is to obtain a thoroughly clean material on which to produce the colors. The methods by which this object is attained are many and varied according to the type of plant available. In the following notes, therefore, no attempt will be made to lay down

* *Silk Journal and Rayon World.*

any hard and fast rules of processing but a general outline of the methods adopted will be given.

DYED GOODS

In the production of dyed goods the silk is processed in a variety of grades each of which contains more or less of the original silk gum according to the method of degumming. In printing, however, the goods are treated so as to free them completely, or as much as possible from silk gum. The reason for this is that printing is a more mechanical process of conveying color to the material than dyeing and there is, therefore, more likelihood of interference with the absorption of the dyestuff by the fiber. In dyeing the color is absorbed gradually over a fairly long period, but in printing the print paste is simply forced into contact with the fabric and the process of fixation is carried out during subsequent operations, which have little or no effect on the bringing of the dyestuff into any closer contact with the fibers. It is obvious that any excess of silk gum which is left on the exterior of the silk fibers is going to affect the absorption of the dyestuff by the fiber, and so for the purpose of producing first-class work in printing it is always best to handle silk which has been completely freed from silk gum. The actual resistance of such residual gum to the colors is not of such great importance as the manner in which the print colors lose their brilliance when applied to a partially degummed fabric. As the brilliance of the colors is one of the main features of silk prints the preliminary operations of degumming, and bleaching where necessary, are of the utmost importance.

As the word degumming denotes, the first operation is the freeing of the silk fabric or fibers from the natural gum or sericin which encloses and cements the fibers together in their original state. Silk as reeled from the cocoon, consists of two filaments which are emitted in a continuous stream from the apical orifices of the silk glands of the silk worm. Silk may, therefore, be considered as a solidified liquid having no cellular structure such as is met with in the vegetable fibers. The two filaments as spun from the silk worm during the formation of the cocoon are cemented together to form one continuous fiber which varies in length from 350-1,250 meters with an approximate diameter of 0.018 mm. The silk gum which surrounds and cements the two filaments is known as sericin and the pure silk fiber freed from gum is fibroin. The percentage of sericin varies from 25 per cent in Japanese or Chinese silk to 30 per cent in Swiss or Italian silks. The outer and innermost parts of the cocoon consist of tangled masses of fibers which cannot be reeled in the ordinary way. Along with damaged cocoons such as those spoiled in steaming, etc., these masses of fibers are first boiled in water then in soda and finally washed and dried. After this they are shredded, carded and spun in the manner of cotton fibers and are known as "spun" silk. These are the principal qualities of silk as produced in the natural or gummed state and with the removal of the quantity of gum required for different purposes the silk is known as *Ecru, Souple,* or *Cuite* as the case may be. *Ecru* silk contains up to 26 per cent of sericin and is also known as hard silk. *Souple* silk contains up to 18 per cent serecin and is known also as soft silk. *Cuite* silk is the fiber which is completely freed from silk gum and is known as boiled-off silk.

SERICIN AND FIBROIN

Both sericin and fibroin bodies are proteins, but they have widely different physical properties. All animate bodies are composed principally of proteins or in chemical phraseology complex condensation products of the amino acids. Proteins are subject to hydrolytic action under the influence of strong acids and alkalies. In such conditions therefore, silk will disintegrate into its constituent amino acids and if the action is allowed to proceed to any considerable extent the strength of the fibers will become greatly impaired. This explains why the use of strong alkalies is out of the question when treating silk fabrics for degumming.

In the ordinary way the preparation of silk for printing takes place in two stages: (1) Degumming and (2) Bleaching. The necessity for the last mentioned process will depend upon the use to which the silk is to be put and upon the thoroughness of the degumming operation in the first instance.

"SOAP AND SODA"

Before proceeding to go into any further detail regarding degumming it might be well to pass on the advice of a great expert of a past generation on silk printing to a contemporary. This expert used as his watchword "soap and soda" and maintained in face of every theoretical objection that there was no better way of degumming silk than the use of plenty of soap with the addition of small amounts of soda ash, so long as the content of the latter was kept under strict control. As a basic principle of working this advice could hardly be bettered.

Another very important point which should be kept constantly in mind, particularly by operatives, is that, after all degumming processes, silk should never be rinsed in cold water. Warm water is invariably indicated for rinsing purposes on account of the danger arising from the chilling of excess gum and its being deposited upon the fiber. It is such deposits as this which give rise to the frequent complaints of unevenness in dyeing and the problem of resist in printing.

For the effective removal of all gum from the fiber and in order to leave it in the best possible condition for printing, not less than 20 per cent soap, calculated upon the weight of silk being processed, should be used. It has definitely been established that quantities up to 40 per cent produce increasingly good results. It follows, therefore, that the higher the soap content the greater the efficiency of the degumming operation and this is precisely the case. The use of such a high percentage of soap is not, however, an economical proposition but the difficulty of

maintaining a high soap content is frequently overcome in the following manner. The first bath is made up at the highest concentration viz., 40 per cent and a proportion of the silk is entered for degumming. When the goods have been thoroughly treated, another batch is entered and a further addition of soap is made to the same bath. Successive quantities of goods are thus treated with corresponding additions of soap until a calculated quantity of silk has been treated with a given quantity of soap in the same bath. The success of the method outlined depends upon the degumming bath containing an excess of soap at any given time. The disadvantage on the other hand lies in the fact that the bath becomes less concentrated with each successive batch of silk to say nothing of its becoming more charged with silk gum. In less concentrated baths the silk has to be treated for longer periods and the danger arises of loss of whiteness and a loss in the tensile strength. In some cases the color of the silk is such that it is only fit for dyeing up in dark shades.

SUCCESSIVE BATHS

A better method is that in which successive baths are employed. In this system as the first baths become charged with silk gum they may be used for dyeing, the boiled-off liquor and the other baths in which the silk is treated during its successive passages from one to the other being gradually moved up to the position of first bath as they become contaminated. The result of this method is that the silk is constantly being treated in cleaner baths during its successive passages from one bath to another and as the final bath is always the cleanest, the silk comes out in a thoroughly clean condition.

TYPES OF BATHS

The type of bath which is used for this purpose is made up on the following lines:—

500 gallons water
30 lbs. Marseilles soap
1 lb. silicate of soda, soda ash or sodium-hexa-metaphosphate.

The silk fabric is treated in this bath for one hour at 195°F. for the first treatment, and successive treatments may be given in the manner indicated, if necessary. A prolonged treatment is sometimes necessary for the removal of the yellow coloring matter in the silk fabric which is due to the retention in some measure or other of the silk gum. This yellow color arises from the presence in the silk gum of a modified form of chlorophyll or the green coloring of vegetable matter. The origin in this case of course, being the mulberry leaves upon which the silkworms are fed. The extra treatment in soap which will be necessary in many cases for the complete removal of this coloring matter will be found to be cheaper in the long run than the use of a bleaching operation for this purpose.

In degumming any quantity of silk the removal of the oils used in spinning is also a matter to be contended with. The oils used for this purpose are removed along with the gum and tend to form a scum upon the top of the degumming bath. Unless precautions are taken to have this oily scum emulsified there is a danger of some of this matter being transferred to the surface of the silk as it is removed from the degumming baths. The surface accumulation of scum in local patches on the material may give rise to trouble in printing and dyeing and any precautions which will lessen the risk of its occurrence will be well worth while. The addition of an emulsifying agent is indicated. The use of this is, of course, always understood to be in conjunction with soap.

Another method of degumming is here appended for the guidance of those who require an alternative method to that already given.

600 gallons water
30 lbs. Marseilles soap
3 lbs. soda ash (if water is hard)

Soap may be used up to 30-50 per cent on the weight of material and soft water is always desirable and in any event not more than one degree of hardness should be tolerated in any boil-off process for silk. The use of sodium-hexa-metaphosphate will give excellent results in conjunction with soap where difficulties with hard water are encountered. The goods are treated in the foregoing bath for 1-1½ hours at 195°F. (never above 200°F.) as silk is likely to turn yellow above the latter temperature. The pH of the bath should be kept below 9 in order to avoid the solvent action of the alkali upon the fiber to say nothing of the resultant loss of luster.

The method outlined may be repeated if necessary for the production of whiter or cleaner goods. This method is used for the production of *Cuite* or boiled-off silk.

Souple silk is cleaned and softened by treatment for ¾-1 hour at 40°C. in

500 gallons water.
30 lbs. soap.

and afterwards soupled by treating in a rinsing bath containing

4 lbs. cream of tartar.
1 pint sulfuric acid 168° Tw.
3 pints sulfurous acid (aqueous).

400 gallons water at 80-90°C.

Afterwards rinse well in hot and cold water alternately.

Ecru or hard silk is simply cleaned in warm water and soap solutions, dried and dyed but seldom used for printing as has already been indicated.

Tussah or wild silk is well washed in soda ash solutions 2 oz. per gallon, then rinsed in an acidified bath of one pint hydrochloric acid per 40 gallons water, rinsed well and bleached by any of the ordinary methods. Well cleaned Tussah silk is capable of giving very choice printed effects.

New Ways of Testing

Woolen and Worsted Lubricants

WERNER VON BERGEN

THE shortage of olive oil in the market caused by the Spanish revolution, has greatly affected the woolen industry, as the Spanish olive oil was by far the best lubricant for the spinning process, especially for the worsted spinning. Not only the difficulty in obtaining this oil but also the small quantity on the market has caused the price to rise from around 80 cents a year ago to $1.50-$1.60 per gallon at present.

It did not take long for manufacturers of olive oil substitutes to realize this fact and therefore today the market is flooded with all kinds of lubricants, which according to the manufacturers, have all the high qualities or are even better than the genuine olive oil.

SYNOPSIS

In this article are discussed the peculiar situation in the olive oil market, the fundamental principles of wool lubrication, the test methods used in testing olive oils and its various substitutes on basis of actual mill trials as well as laboratory tests. A new ageing test developed with the Fade-o-meter is introduced, which gives in 40 hours the same result as heretofore required one year. The back-washing test is replaced by a washing test in the Launder-Ometer.

By comparing the different substitutes with olive oil, it was found with these new tests that the manufactured vegetable esters are in their general properties equal to high grade olive oil and superior in their uniformity, whereas the mineral oil containing lubricants are lacking more or less in their scourability.

Before we discuss these various substitutes let us make clear the reason for applying oil to wool in the various spinning processes. The reasons are:

1. To lubricate the rough fibers and to reduce the breakage of them to a minimum in the carding process.
2. To increase adhesion of wool fibers to one another, to facilitate the work of condensing, drafting and spinning.

It depends entirely on the nature of the fiber and the method of processing as to the amount of oil necessary for proper lubrication.

In *Worsted Carding* the experience has proven that approximately 1 per cent of oil produces the best sliver in respect to the length of fibers and the number of neps. This figure was also scientifically verified by Speakman's work at the University of Leeds.*

In the *Carding and Spinning of Woolens* 5 to 10 per cent of a lubricating oil is necessary to give prefect cohesion to the loose roving. As the fibers are normally very short (below 1½ inches), the prevention of breaking the fiber is not of such importance as in worsted carding where the average length of the fiber is above 2 inches.

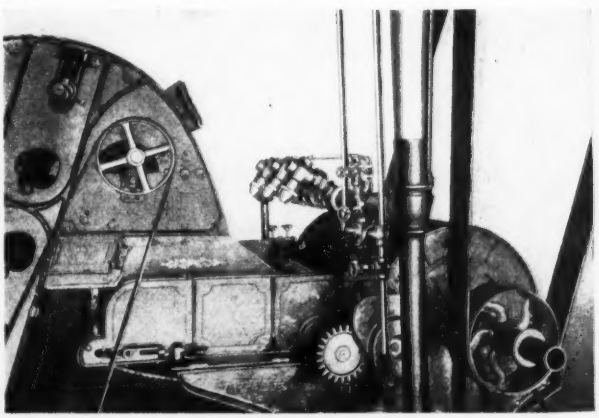
*"The Oiling of Wool," by J. B. Speakman. Reprint from the *Journal of the Society of Chemical Industry*, 6/8/34, Vol. LIII, No. 23., pp. 173-177t.

METHOD OF APPLICATION

To secure uniform distribution of the oil, the applying of the oil to the wool must be done prior to the carding process. The oil is therefore applied to the loose wool after the washing process. In modern mills this is done by spraying the oil in the form of an emulsion through automatic sprayers in connection with the mixing picker. One of the best devices to do this, is the Turbo Oil Sprayer from Parks-Cramer, as seen in Fig. 1. For satisfactory work it is necessary to have a stable emulsion. For making up an emulsion, we have a number of very effective emulsification agents on the market, such as Stearamid, or Triethanolamine. The stability of an emulsion depends on the size of the oil globules, which must be four microns or less in diameter. Any colloidal dispersion or emulsion containing globules below four microns will show the Brownian movement. Therefore, an emulsion which shows under the microscope the Brownian movement will be more or less a stable one. The photomicrographs, Figs. 2 to 4, are illustrating emulsions as seen under the microscope. To be called a stable emulsion it should stay at least 48 hours without separating. In large mills it is

(Continued on page 256)

Fig. 1—The Turbo Oil Sprayer in Actual Use on Mixing Picker.



PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

MAY 3, 1937

Officers of the Association

WILLIAM H. CADY, *President*
U. S. Finishing Co., Providence, R. I.

ALBAN EAVENSON—ELMER C. BERTOLET, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline & Chemical Co., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass.

LOUIS A. OLNEY
President Emeritus and Chairman of the Research Committee
Lowell Textile Institute, Lowell, Mass.

Councilors-at-Large

BERKELEY L. HATHORNE — HAROLD M. CHASE
G. R. KREMERS — ARTHUR E. HIRST
CARL Z. DRAVES — HENRY F. HERRMANN

Councilors Representing Sections

BEN VERITY (Rhode Island) — R. M. RITTER (Philadelphia)
HANS MEYER (New York) — ELMER F. SMITH (Midwest)
ROLAND E. DERBY (N. New England) — R. S. WHEELER (South Central)
C. A. JONES (South Eastern) — CHESTER L. EDDY (Piedmont)

Local Sections and Their Officers

Northern New England Section
Carl Z. Draves, Chairman, Ludlow Mfg. & Sales Co., Ludlow, Mass.
Jonn N. Dalton, Secretary, Pacific Mills, Worsted Division, Lawrence Mass.

Rhode Island Section
John G. Masson, Chairman, Rosemont Mill, Woonsocket, R. I.
Raymond A. Pingree, Secretary, 7 Sayles Ave., Saylesville, R. I.

New York Section
George L. Baxter, Chairman, Bradford Dyeing Association, 40 Worth St., New York, N. Y.
P. J. Kennedy, Secretary, E. I. duPont de Nemours & Co., Inc. 61 Thomas St., New York, N. Y.

Philadelphia Section
Herbert S. Travis, Chairman, Rohm & Haas Co., Inc., 222 West Washington Square, Philadelphia, Pa.
R. W. Delaney, Secretary, National Aniline & Chemical Co., 200 S. Front St. Philadelphia, Pa.

Piedmont Section
Thomas R. Smith, Chairman, Wiscassett Mills Co., Albemarle, N. C.
A. Henry Gaede, Secretary, Laurel Soap Mfg. Co., Charlotte, N. C.

South Central Section
Walter E. Hadley, Chairman, Standard Coosa Thatcher Co., Chattanooga, Tenn.
Murray B. Smith, Secretary, 2404 Union Ave., Chattanooga, Tenn.

Midwest Section
Edward J. Siegrist, Chairman, Holeproof Hosiery Co., Milwaukee, Wis.
Herbert W. Tetzlaff, Secretary, Geigy Co., Inc., Milwaukee, Wis.

South-Eastern Section
E. A. Feimster, Jr., Chairman, Eagle & Phenix Mills, Columbus, Ga.
Alfred R. Macormac, Secretary, Alabama Polytechnic Institute, Auburn, Ala.

Lowell Textile Institute Student Section
Lee Gale Johnson, Chairman; Hugh Francis Carroll, Secretary.

North Carolina State College Student Section
A. E. Snumate, Chairman; J. W. Furr, Secretary.

Philadelphia Textile School Student Section
John L. Waldo, Chairman; Wayne F. Fry, Secretary.

Members should notify the **Secretary** immediately of all address changes

ANALYTICAL METHODS

The Council has authorized the republication of the "Analytical Methods for a Textile Laboratory" in the 1937 Year Book. The committee in charge of this section will be glad to correct any errors or omissions in these methods as published in the 1935-36 Year Book. The members of the A. A. T. C. C. are therefore requested to review these methods and send to the chairman of this committee not later than March 15, 1937, any suggestions for the improvement of the existing methods or any new methods which seem suitable to include in this section.

Walter M. Scott, Chairman,
857 Boylston Street,
Boston, Massachusetts.

REPRINTS

Analytical Methods

Reprints of the Analytical Methods as printed in the 1935-6 Year Book are now available from the secretary of the Association for $.75 per copy postpaid.

CALENDAR OF COMING EVENTS

Meeting, New York Section, May 21, 1937, Chemists' Club, New York, N. Y.

* * *

Annual Outing, Philadelphia Section, White Marsh Country Club, Philadelphia, Pa., May 14, 1937.

* * *

Meeting, Northern New England Section, Andover, Mass., May 7, 1937.

* * *

Summer Outing, Piedmont Section, Ocean Forest Hotel, Myrtle Beach, S. C., June 25 and 26, 1937.

* * *

Annual Meeting and Convention, December 3 and 4, Bellevue-Stratford Hotel, Philadelphia, Pa.

Manufacture and Properties of Spun Rayon*

F. BONNET†

THE subject originally suggested for this talk was as stated by your chairman the "Dyeing and Finishing of Spun Rayon" but to speak on this subject in general terms before this organization would be like "carrying coals to New Castle," particularly when the speaker is neither a dyer nor a finisher; but it was thought that if a picture can be presented of the manufacture, properties and versatility of spun rayon then you as dyers and finishers may better understand many of the problems which may arise in the handling of this newer product.

Cut staple, staple fiber and "Fibro" are of course all one and the same thing and are essentially nothing more than ordinary continuous filament rayon mechanically cut or chopped up to definite fiber lengths.

But why, you may well ask, should continuous filament yarn be thus cut into short lengths?

The incentive to do this came during the war when Germany, cut off by blockade from importations of foreign textile raw materials, turned to her rayon industry to supply her with manufactured fibers of lengths from 1.5 to 5 or 7 inches suitable for spinning on her idle cotton and wool machinery. After the war this development was almost lost sight of but then came the world depression when financing of foreign credits for raw materials became difficult and Germany and Italy again turned to cut staple to help supply their textile mills and make them more self-contained. This led to a concentration of effort and research sponsored and subsidized by these governments.

But why should such cut staple be of interest to us who have raw materials in more than adequate supplies?

The answer to this is that at first the United States was not much interested. In fact cut staple seemed to be in the class of a waste product. Ever since there was a rayon industry the waste, i. e., defective yarns, yarns with mussed up and broken filaments, soiled yarns and the general tag ends of yarns were collected and sold as waste. This was garnetted, pulled apart and made into various yarns but there never was much of it and what there was, was of varying length, filament size, etc. When however, the staple was spun with the avowed purpose of being cut, the product became a very different raw material, uniform in fiber size, uniform in length which made processing easier and produced quite different results.

But you will ask, is not such spun material much more expensive than the natural textile raw materials?

To answer this we will consider very briefly the manufacture of the spun yarn which initially is no different from continuous filament yarn. The same spinning solutions, the pumping of the cellulose solution through multiple hole jets, the precipitation of the fiber are all essentially the same as for continuous filament yarn but the difference comes in the handling of the precipitated fibers after spinning.

For the continuous filament, the yarn from each jet is collected in a centrifugal box or on a bobbin so that after a definite length of time these boxes must be emptied or the full bobbins replaced with empty ones. The yarn is then treated either in cake form or in skeins through the various chemical processes, washed, given a soft finish, dried and packaged.

In the case of the acetate process the yarn is usually air spun and needs essentially no further treatment except packaging.

The continuous filament yarns are therefore handled in small units, say in skeins, of anywhere from a few thousand to perhaps 20,000 yards. In the case of the spun rayon the handling is in bulk.

There is the same spinning frame as for making the continuous yarn but the spinning jets for spun rayon will have at least ten times as many holes per jet. This means that more spinning solution must be pumped through the jets assuming the filament size to be the same. This in turn means making up spinning solutions on a much larger scale. At the spinning machine the jets in both cases are immersed in the coagulating bath but instead of the yarn from each jet being collected on a bobbin or in a spinning box the threads from the jets on one side of a spun rayon machine are all collected and drawn off as a continuous tow or rope which is then accurately cut or chopped into any desired filament lengths. There are two methods of cutting the tow, i. e., dry and wet. In the dry system the tow is run through the various chemical treatments and emerges as a desulfided, bleached and finished white tow which goes to the cutter. In the wet system the raw

* Presented at meeting, New York Section, Feb. 26, 1936.
† The Viscose Co.

impure rayon from the spinning while still wet with acid and under considerable stretch is run directly to the cutter and the raw stock is desulfided, bleached and dried in bulk and the finished stock is passed through an opener and baled.

The wet cut system allows the cut raw staple to contract and crimp which gives a certain amount of drag to the spun yarn resulting in better spinnability similar to the spirality of cotton.

In the dry cut system the filaments of the tow are held parallel until cut in the final dry and finished state and thus have very little, if any, crimp. In either case the cut and finished staple is run through an opener before baling. This opening is important so as to break up any adherence of the fibers which may have come through in bunches but must not be so rough as to break the fibers into shorter lengths. The acetate process for making cut staple is perhaps simpler in that the yarn is usually air spun and thus as it leaves the spinning machine merely requires cutting to be ready for baling.

It will readily be seen from this brief description that the production of cut staple is not only on a much larger scale per unit but the handling of the spun material in bulk greatly reduces the labor cost so that a pound of cut staple can be put out on market here for about half the price of continuous filament yarn which is not far different from the price of high grade cotton and quite a little less than high grade scoured wool.

You will now ask why has cut staple any advantage over natural fibers?

In the first place it is obvious from what has been said that spun rayon fibers are more uniform both as to fiber length and size (denier); and it can be made to any definite fiber specifications desired by the spinner. Thus, the 1.5 denier filament size corresponds to the average cotton fibers used in this country. The 3 denier corresponds to the coarser cottons like Peruvian, India and Chinese or the finer wools. The 5.5 denier corresponds to the regular wool and worsted fiber size, while still heavier sizes may correspond to mohair, rabbit hair, etc. The 1.5, 3, 5.5 denier filament sizes have become more or less standard for spun rayon today.

The length of fiber can also readily be varied by the setting of the cutting machine. For cotton spinning the standard length is 1-7/16 inches which seems to give the best strength with 1.5 denier filament. Shorter lengths have also been made, usually to blend with cotton for some particular purpose. Lengths more than 2 inches (2 to 7) are usually used in wool or silk spinning. The character of a fabric may therefore be changed by substituting coarser filaments for fine and finishers have sometimes been blamed for poor finishing because a fabric did not match up to that of some competitor, not knowing that the difference was due entirely to the choice of filament size and length of staple of the raw material.

In addition to this control of fiber size and staple length the spun rayon can also be made in varying degrees of luster just as continuous filament yarn, that is to say, as bright, semi dull or dull. At the present time bright predominates. Dull was used to some extent last fall in wool mixtures but bright is almost exclusively used in wool mixtures. Not only can spun rayon be used by itself but it lends itself well to mixing with natural fibers and acetate to produce novel effects. Thus, for example, a small admixture of wool allows cross dyeing to give a heather effect, the wool being added merely to give the decorative effect.

You will now ask, does not the addition of spun rayon to wool mixtures weaken the fabric?

Curiously enough the worsted manufacturers when they first tried blends with rayon staple quite fully expected to get weaker yarns and fabric but to their surprise they found that such blends were not only as strong but even stronger than the all worsted yarns both dry and wet. This blending of spun rayon has curiously brought about an interesting development in the use of wool in cotton mills.

What types of cloth are made from spun rayon?

At the present time the majority of spun rayon is processed on the cotton system and goes into the linen type or dress fabrics made with slub yarns and the challis type of which there are many constructions and price levels. Its use in serges, summer suitings, both for men and women, is increasing. It is also used blended with natural fibers of cotton, wool, silk and linen. Blended with cotton, for example, where colors and white are desired in the same cotton yarn, the addition of the rayon staple gives a much cleaner white than cotton and incidentally makes the stock dyed cotton colors seem much more brilliant.

Rayon staple gives a much softer more pliable yarn than cotton and the degree of softness may be regulated by ratio of the blend depending upon the kind of fabric desired. Cotton fabrics are not as absorptive as cut staple fabrics of the same construction which has led a nationally known towel manufacturer to put out a dish towel containing cotton, rayon staple and linen, all blended together which makes use of the characteristic properties of each fiber, strength, absorption and freedom from lint.

Having briefly outlined the nature of spun rayon it is obvious that the dyeing of the fiber follows that of dyeing continuous filament rayon. In some cases the fiber directly from the bale after a light opening is dyed in bulk usually for the woolen trade. The difficulty in dyeing the fiber in bulk is that it swells and tends to tangle and form lumps with the result that uniform dye penetration is difficult, but if the tubs are not over crowded and plenty of solution is used to thoroughly float the fibers this system of dyeing has been quite effective.

In hank dyeing the skeins have a tendency to curl and

give trouble but again if over crowding is avoided, both as to skein size and number of skeins on a rod, there is little trouble. By far the greatest amount of spun rayon dyeing is done in the piece which perhaps gives on the whole less trouble than continuous filament yarns.

Like rayon the best results are usually obtained by a careful selection of dyes and their proper application. In this connection we would call attention that recent work has shown that some of the most unlevel dyeing but fast colors can be used with excellent level results if it is remembered that such dyes are apt to be very sensitive to salt and salt additions to the bath. If, however, the addition of salt is carefully controlled excellent level and fast dyeings result. So in general the actual dyeing of spun rayon fabrics offer essentially no more difficulty in fact, often less, than does the dyeing of ordinary continuous filament yarn.

When we come to finishing we have a somewhat different picture. Fabrics made of spun rayon, particularly those with the finer filaments, are very soft and pliable and have excellent draping qualities. While the heavier denier filament yarns and fabrics are somewhat less soft all these fabrics tend to wrinkle and crush rather easily. Wool fibers on the other hand have a certain resiliency or springiness due to a true elasticity of the fibers so that a fabric when crushed tends to spring back with little or no crushing. Neither continuous filament rayons nor the spun staples derived from them as made today have practically any true elasticity, a maximum possibly of perhaps 2 per cent. The measurement of elasticity while hard to measure accurately, at best that of rayon is certainly considerably less than that of natural silk or wool. It is this property of a lack of a higher degree of elasticity that makes rayon less crease resistant and less adaptable, for example, for use in full fashioned hosiery.

The old finishes of sulfonated oils, waxes and the like when applied to spun rayon fabrics do not help matters much in this respect and if anything they tend to make the fabric less resistant to crushing while usually adding a disagreeable objectionable rancid odor. In recent years, however, certain synthetic resin finishes have been developed which threaten to entirely displace the older finishes. These resins were primarily developed as plastics of which Baekelite, the formaldehyde phenol resin is the pioneer and classical example and is mentioned here merely for convenient reference. The discovery of Baekelite has lead to the development of a host of other condensates or synthetic resins. Some of these are made from urea and formaldehyde, from the polyvinyl alcohols, the acrylic condensates, to mention but a few, and some of these show considerable promise in the textile filed. Such resins are usually applied in water soluble form together with the necessary catalyst at the quetsch to get uniform distribution on the fabric which is then heated usually in the presence of steam to the rather high temperature of 260-280 degrees F under which the resin is rendered quite insoluble.

The character of the polymerized resin is important and a resin like the urea-formaldehyde will provide the resiliency to the fabric which is lacking in the fibers of which the yarn or fabric is composed. Other resin treatments will make the cloth water repellent, e.g., umbrella cloth, and spot resistant. Water clear resins are desired so as to have little or no effect on the brilliancy of the colors and in no case do any of the serviceable resins have any odor. Again high temperatures for curing or setting the resin are objectionable both as to the effect on the fiber and on the colors.

Rather intensive research is being undertaken to find synthetic resins which can be rendered insoluble at temperatures around the boiling point of water and which will have no deleterious effect either on the yarn or the dyes. However, all this is of quite recent development and while much research has been done on the finishing of spun rayon fabrics the whole subject is still new and wide open.

There is no question that much more has been done with spun rayon abroad, especially in rayon suitings and various other fabrics, than in this country. It was the production of spun rayon clothing of all kinds on a large volume scale in Germany, Italy and England that aroused at first interest, then confidence in spun rayon developments in our own market. It is no reflection on the initiative and ingenuity of the textile industry in this country because there was not the economic pressure here as in Europe, but when some of the large textile manufacturers on a visit to Europe saw what strides had been made in this field abroad they became interested and a steadily increasing amount of the cut staple began to be used. This is perhaps best shown by the fact that in 1934 the world production of rayon staple was only 53,000,000 pounds. The next year it was 135,000,000 pounds or bringing the matter nearer home consider the following United States cut rayon consumption as given in the following table from the Textile Organon in 1,000 pounds:

	1930	1931	1932	1933	1934	1935	1936
Domestic production	350	880	1,100	2,100	2,200	5,200	12,400
Fiber and yarn imports	518	715	2,197	3,320	222	1,461	13,000
Total	868	1,595	3.297	5,420	2,422	6,661	25,400

It will be seen that cut rayon staple was on its way even before the world depression but in 1935 consumption in this country was roughly three times that of 1934 and in 1936 it was practically four times that of 1935. It is significant that of the rayon staple imported practically 50 per cent came from Japan and under existing tariffs can be put down in this country at a price the American manufacturer cannot meet. This condition does not offer much inducement for the American manufacturer to enter the field. Nevertheless, large new plants for rayon staple production are being built.

We have thus briefly tried to give you some idea about cut rayon staple which, however, would be incomplete without mention being made of a special type of fiber which has recently been developed in Italy, namely Lanital. This is a fiber spun from a solution of Casein and used as a substitute for wool. In its emperical composition and in its ability to take certain dyes it resembles wool even though its basic molecular structure is definitely stated not to be like wool at all.

A good deal of publicity has been given to this development which has aroused interest in agricultural, i. e., dairy communities who might benefit in the production and sale of the skim milk raw material.

The fiber as produced at present is only from 10 to 20 per cent as strong as wool but further investigations and developments in this new field will no doubt bring about a material improvement. Italian sources claim there is a steady market for about two tons of Lanital per day (1,200,000 pounds per year) and that an increase in production capacity will provide an annual production of some 3,500,000 pounds.

In closing this brief outline of the manufacture, properties and uses of spun rayon, its recent development, and the great interest it has aroused in the entire textile field throughout the world, may we point out that its versatility as a textile fiber is just beginning to be understood and that much development work must still be undertaken. Some of this work is being done by the manufacturers of the fiber as, for example, by Courtaulds in England in their Arrow Mill at Rochdale, Lancashire under the direction of Mr. H. Ashton. Much information is already available as to the best conditions for handling this newer fiber during blending and finishing but much more work must be done in the matter of developing the extraordinary versatility of the spun rayon. When we consider the recent rapid strides made in its production and consumption may we not wonder whether eventually the tail may begin to wag the dog.

DISCUSSION

Chairman Baxter: I am sure you have all enjoyed listening to this very interesting paper by Dr. Bonnet. I like one expression that he used there as to the development being new and wide open. He has assured me that the discussion that may follow his paper could perhaps be along similar lines. I am sure there are a lot of questions that some of you may wish to address to Dr. Bonnet.

Mr. Johann: Dr. Bonnet, you mentioned the detrimental effect of sulfonated oil because of possible rancidity. Have you done any research work on the use of the Avirols or Avitex products that will not lend rancidity as finishing agents?

Dr. Bonnet: The old finishes of sulfonated oils were mentioned merely in passing and that they did not seem to give satisfactory results with these newer fabrics. The Gardinols, Avirols, and products of that type certainly give no odor and are being extensively used. Curiously enough the layman is apt to associate the rancid finishing smell with rayon and blame the yarn. In any case such oxidizeable oils which go rancid are well known to have a degrading and weakening action on the regenerated cellulose type of rayon. Hence even aside from the objectionable odor oxidizeable oils can hardly be recommended for finishes. A good sulfonated oil made from high grade materials does not give the objectionable odor as one made from poor raw materials poorly sulfonated.

Mr. Johann: Has any work been done with the use of spun rayon in combination with ramie and East Indian leaves of various sorts, hemps, and etc.; a combination of spun rayon and hemps and ramie.

Dr. Bonnet: There has no doubt been some work done on the matter of using ramie, hemp, and so on, in combination with spun rayon just as has been done with cotton and wool. Really, the field is so wide open and so many things have been done, I must frankly confess that I don't know half of the experiments that have already been done in this wonderful field of development. Therefore, I cannot answer your question specifically.

Mr. Johann: Would you say that the combination of ramie and such products would materially increase the tensile strength of the spun rayon? I mean the combination to make a suitable fiber.

Dr. Bonnet: In the case of wool and cotton, for example, it is a question of choice of filament size and staple length as to whether the yarn is going to be stronger or not so strong. In the case of wool, as pointed out, the yarn was stronger. For detailed information I would refer you to the paper of W. Hardacre published in the J. Textile Institute August 1936 P. 315; also "Worsted Spun Staple"—Textile World October 1936 P. 68. Mr. Hardacres' paper was also published serially in recent numbers of the Daily News Record.

Mr. Johann: The reason I mention ramie is that there is considerable research going on at the present time with combinations of ramie and rayon and wool and cotton to produce new and what they claim better fibers and fabrics.

Dr. Bonnet: No doubt, but this subject of yarn combinations with spun rayon is so new the subject is still wide open.

Mr. Johann: You mentioned the expression "tow." Would you define that?

Dr. Bonnet: The word "tow" was used to designate the collection of ends from a number of spinning jets. Let us assume each jet has 1000 holes and is spinning 1500 denier. If 50 such ends are collected there would be 50,000 filaments which together would make a tow of 75,000 denier, practically a rope of filaments which is pulled along over a pulley to the cutting machine in the wet system. In the dry system the tow is taken and run over various arrangements through tanks to treat the yarn

which is finally finished and dryed in tow form after which it is cut into the desired length of staple.

Mr. Barber: I am going to ask a question as to what the dyers need to know in regard to these yarns, whether it is better to have a carded yarn or a mill-spun yarn, and what oils are used in the processing. Some seem to be in favor of the linseed oils, others are in favor of sulfonated oils. I think that is an interesting point to the dyers on account of the scouring of the cloth after it is woven.

Dr. Bonnet: You are asking a question regarding the actual mechanical operation of spinning. I must confess, again, I am not a spinner. However, in wool spinning it is common practice to use certain oils many of which are of the oxidizeable type but which do the wool no harm. In the matter of spinning or processing spun rayon, rayon (whether spun or continuous filament) is not improved by the presence of oxidizeable oils, such as linseed oil, olive oil, neatsfoot oil, and so on, and I need not explain to you gentlemen who are chemists that such oils tend to degrade the cellulose. It really does not matter so much if the material is immediately removed from the yarn but that is rarely possible. The yarn must often be stored and in the presence of moisture, air and light such oils act on the rayon and gradually weaken and disintegrate it. For spun rayon oils of that character should not be used but instead possibly high grade sulfonated oils or sulfonated fatty esters in combination with high grade mineral oils. The difficulty in using any of the oxidizeable oils even aside from their action on the yarn itself is that as they oxidize they are very difficult if not impossible to remove and then act as a dye resist; and even if they are removed the rayon yarn itself may have been affected to such an extent that it will no longer take the dye uniformly.

Mr. Lutz: I was wondering if spun rayon fabrics can be pre-shrunk to the same limits as cotton fabrics.

Dr. Bonnet: Yes, they can.

Mr. Lutz: Is there a difference whether a staple has been cut wet or dry?

Dr. Bonnet: That is somewhat of an open question. One of the reasons perhaps for wet cutting is this: when the rayon has been pulled out and stretched and is then processed perfectly loose in the cut staple, the filaments have a chance to shrink and to crimp and in so doing all natural fiber shrinkage has been removed and the irregular bends and twists in the fiber make for better spinnability. However, most of the shrinkage trouble comes in the actual yarn spinning. If, in the yarn spinning, the filaments are pulled so that they are taut and are stretched, considerable shrinkage may take place in the cloth afterwards. This was one of the troubles in connection with the earlier yarns that were made. Possibly Dr. Sommaripa would confirm this statement that this trouble has largely been overcome by proper spinning and proper handling of the yarn in the manufacture of the cloth. I think I am right in this.

Dr. Sommaripa: Yes.

Mr. Lutz: Can spun rayon cloth be shrunk with the same machinery as ordinary cotton?

Dr. Bonnet: I think it can.

Dr. Sommaripa: Yes, I agree with that.

Mr. Johann: Does the spun rayon have any better creping qualities than the regular long staple rayon?

Dr. Bonnet: The matter of creping is rather an involved problem, but one which is rather interesting. If you take an ordinary continuous filament rayon and wet it out it swells and gets longer, whereas, a cotton thread wet out in the same way gets shorter. If the same yarn is twisted with say 55 turns and is then wet out it promptly shrinks. The matter of creping is a subject under investigation at the present time by the Throwsters Research Institute and their results will no doubt prove of considerable value.

Mr. Johann: Which would give the better creping?

Dr. Bonnet: That will depend upon the nature of the yarn itself and upon how the crepe yarn has been processed, i. e., if it has been processed under tension or with as little tension as possible. For example, if some of the yarn is damp it will stretch more and will give a different creping effect and pebble subsequently than the corresponding dry yarn. The same yarn may give a different pebble in the same quill. The matter of creping, gentlemen, is a problem all by itself. You ought to have a special speaker on that subject.

Mr. Degrott: In the weaving of spun rayon is it necessary to dress a warp of the spun rayon with a protein substance?

Dr. Bonnett: You mean size it?

Mr. Degrott: Yes.

Dr. Bonnet: Yes although it need not necessarily be a protein substance. Potato starch is used in many instances which has given quite satisfactory results. Subsequently in finishing it must of course be removed so as to get a proper finish. Spun rayon is perhaps a little more difficult to size because of the nature of the yarn. The continuous filament yarn will take the size a good deal easier and perhaps more uniformly, whereas due to the roughness of the spun fiber a spun rayon warp is therefore usually run around the size roller so that the warp sheet is submerged and thus gets a better and more uniform wetting out with the size.

Mr. Sokolinski: My question is along the lines of Mr. Johann's original one about the rancidity of the oil in the sulfonated oils and tallows. Mr. Johann probably was in defense of their materials, but now I am in defense of the manufacturers that make the sulfonated oils. There are sulfonated oils and tallows and sulfonated oils and tallows. There are some made from the poorer materials and there are others made with a lack of knowledge as

to how to make them from the high grade materials. We happen to be supplying some manufacturers with those materials now, and have others who are good prospects, and if they read anything like that they will immediately become frightened and be afraid to use them. I don't think that is in accordance with the facts.

Dr. Bonnet: I quite agree with Mr. Sokolinski that there are sulfonated oils and sulfonated oils. Made of high grade materials properly sulfonated such oils have given quite satisfactory results in finishing, but any finishing oils which turn rancid when the goods are stored are objectionable both from the esthetic side and their effect on the yarn as explained. I might even add that some high grade sulfonated oils have resulted in no odor nor any deleterious effect on the yarn. When I speak of rancid oils affecting rayon I speak feelingly.

Dr. Sommaripa: I just wanted to answer your remark about creping. Originally, of course, 95 per cent of all staple was used in crepe yarn, and then 200 denier rayon came in and this gave a much more uniform pebble which really killed spun rayon crepes, and that is why there was the big drop in spun rayon consumption. However, I also want to ask a question on the same subject, and that is: Do you think that the elongation in spun rayon has a bearing on the quality of the creped yarn?

Dr. Bonnet: I think it does.

Mr. Barber: What has been your observation on the spinning of single spun rayon as to the evenness of the yarn compared with either cotton or worsted? You know in cotton or worsted when we have single spun yarns we get thickening in places. In the spun rayon, if the fiber is either carded or combed, which is the best result?

Dr. Bonnet: That is very easy to answer for this reason: The artificial or the manufactured staple is so much more uniform than any natural fiber, for example either cotton or wool, that the spinnability is greatly increased and the yarns are more uniform. There is also much less waste due to the uniformity of the size of the filaments. Because of the uniformity in filament size and staple length, it also takes fewer twists to get the proper sized yarn. The purpose of twisting these fibers together is nothing more or less than to hold them so as to get the actual strength of the fibers. More twisting than that does not do any good and less than that causes the fibers to pull apart by sliding on each other.

Dr. Smith: I would like to ask if you have an idea of the approximate sizes, the finest sizes, that are being spun of one hundred per cent rayon by the cotton, the wool, or the spun silk system? How far have we gone toward the finer numbers?

Dr. Bonnet: I think probably Dr. Sommaripa would have the latest figures. I am going to call on him.

Dr. Sommaripa: On the cotton system yarns in this country have been spun as fine as the 120's, but the bulk of single yarns is not used in finer counts than single 40's. On the worsted system most of the yarns spun (the finest yarns) are equivalent to single 30's on the cotton count...

. . . At this point Dr. Bonnet passed around samples of raw materials as follows: 1½ denier 1-7/16"; 5½ denier, 1-7/16"; and 5½ denier, 3½", delustered with titanium dioxide. . . .

Mr. Barber: I will take exception to that last answer. This week I received correspondence from the other side and they are spinning 80's for doubling purposes, making 40's twofold yarn.

Member: Under what system, Mr. Barber?

Mr. Barber: On the cotton system.

MEETING, NORTHERN NEW ENGLAND SECTION

A MEETING of the Northern New England Section was held at the University Club, Boston, Mass., on April 2, 1937, with about seventy-five members present.

A very interesting paper entitled "The Chemistry of Wool" was presented by Dr. Milton Harris, our Research Associate at the Bureau of Standards. Dr. Harris presented a summary of the work which he has accomplished in a study of the chemistry of the wool protein and how these results can be introduced by the textile technologist in the interpretation of various phenomena in the textile processing of wool. This paper of Dr. Harris' is one of the finest which our Section has been fortunate enough to hear and was of considerable value to those present.

An announcement was made of the Open Forum meeting which is to be held at the Andover Country Club, Andover, Mass., on May 7.

Respectfully submitted,

JOHN N. DALTON, *Secretary*.

CORRECTIONS

Re Membership Applications

April 5 issue: Associate Applicant John C. Bashan should read John C. Bashaw. Address of Active Applicant H. E. Engel should be changed to Fairview, N. J.

April 19 issue: It was erroneously stated that Active Applicant William L. Fickert was connected with Interstate Hosiery, Lansdale.

Annual Meeting and Convention
December 3 and 4
Philadelphia, Pa.
Headquarters
Bellevue-Stratford Hotel
Plan to attend!

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the secretary or the American Dyestuff Reporter any vacancies which may occur in their businesses.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

NOTE: PERSONS WHO HAVE OBTAINED EMPLOYMENT SHOULD NOTIFY THE SECRETARY OR THE AMERICAN DYESTUFF REPORTER AT ONCE.

Prospective employers may file vacancies either with the secretary or the American Dyestuff Reporter.

A-1

Education—B.T.C., Lowell Textile Institute.

Experience—Two years as chief chemist in cotton mill. Experienced on direct, vats, naphthols, sulfur, basic and developed colors. Two years' experience in protein, fat fiber and mineral control in grains and animal feedstuffs. Age 28.

A-B-1

Education—Graduate chemist and colorist from a leading textile institute. Speaks French fluently. High standing at school. Awarded 1st prize in chemistry. Member of honor society.

Experience—Knowledge of most processes of textile manufacturing and some experience in woolen and worsted piece and stock dyeing and color matching. Presently employed in other department but wishes to get into laboratory or dyehouse.

A-B-5

Education—Graduate of the University of Lausanne, Switzerland. Doctor's degree in Chemistry. Knowledge of French and German.

Experience—Eleven years with large bleaching, dyeing, printing and finishing plant as assistant Chemist and then Chemist in charge of the Laboratory. Experience in dyeing and printing cotton and rayon fabrics; research and analytical work. Woman.

A-B-7

Education—Evening school in textile dyeing.

Experience—2 years laboratory in dyehouse; 9 years dyer and foreman on hosiery, ribbons and rayon; 2 years assistant to superintendent. Can handle help efficiently. Desires position as supervisor or demonstrator of dyestuffs. Age 30; married. Prefers vicinity of New York.

A-B-C-1

Education—B. S. in Chemistry, Massachusetts Institute of Technology.

Experience—7 years with a prominent worsted mill as assistant chief chemist, chief chemist, and superintendent of dyeing and wet finishing. Thoroughly familiar with chemical problems of worsted industry. Age 33; single. Location unimportant.

A-B-C-2

Education—Graduate of Lewis Institute of Engineering of Chicago and graduate of Philadelphia Textile School (Chemistry and Dyeing department).

Experience—Has had extensive experience as assistant chemist and colorist in silk printing, dyeing and finishing; also dyeing raw stock wool; and dyeing and finishing cotton and rayon. Age 30; married; references.

A-B-C-3

Education—Graduate, Chemistry and Dyeing Course, Lowell Textile Institute, 1934.

Experience—Has experience as chemist; dyer of union knit goods (cotton and woolen); experienced bleacher on both. Has handled Tube-Tex processing on cotton and rayons. Single; will go anywhere.

A-B-C-D-1

Education—B.S. in Chemistry, Massachusetts Institute of Technology.

Experience—Combination of plant and laboratory work pertaining to bleaching, dyeing, printing, finishing of cotton, wool, artificial silk. Familiar with wool scouring; sizing of cotton, wool, rayon warps; analytical work; some experience in the manufacture of soaps, finishing compounds and wetting agents; technical service and sales work; paper mill experience; age 44; married; two children.

B-3

Experience—Foreman piece dyer for the past 21 years. Can dye the following: celanese, rayon, cotton backs, wool, silk and mixed fabrics. Has knowledge of finishing and laboratory work.

B-4

Experience—Foreman dyer in charge of ribbon dyeing for 20 years. Experienced on silk, cotton, rayon, acetate yarn. Age 41; will go anywhere.

B-F-1

Experience—As executive had charge of the dyeing of ribbons and piece goods for 6 years; spun silk yarn, fast and resisted dyeing for 8 years; hosiery for 12 years. Has been quite successful in all three of these mills. Age 50 married. Will go anywhere.

F-1

Education—Graduate of School of Textiles, Saxony (1925). Graduate of School of Commerce of University of Berlin (1928).

Experience—Worked in various departments of textile mills as worker, later as a supervisor. Familiar with the production, calculation and management of manufacturing. Thirty years old; unmarried.

AMERICAN
DYESTUFF REPORTER

A. P. HOWES
Publisher

LOUIS A. OLNEY, Sc.D.
Professor of Chemistry and Dyeing, Lowell Textile Institute
Directing Editor

NORMAN A. JOHNSON
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

Subscription price: $5.00 per year Canadian, $6.00; foreign, $6.00

Vol. 26 May 3, 1937 No. 9

ANOTHER SUCCESSFUL SHOW

THERE can be no doubt but that only a few of the persons who attended the thirty-third annual showing of the Knitting Arts Exhibition in Philadelphia the week of April 19th have anything but praise for this latest display of the knitting arts. Similar in general appearance to its recent predecessors, it may have been "just another trade show" to some, but not to those who inspected it with any care. The largest display of its kind ever staged in this country, it did not draw as large crowds as some of its predecessors, but there was what many exhibitors called a record-breaking turnout of the important mill men, the men who say yes or no when it comes to important purchases of new equipment and supplies.

It was the improved appearance of the Exhibition just closed which impressed careful observers most. Individual displays throughout the exhibition hall were pepped up to a greater extent than ever before. There was more liberal use of color and electrical effects. The general sprucing up of the Exhibition has now proceeded to the point where there is hardly a booth on the floor which does not show the results of careful planning; many of them were effective examples of the designer's art. A trade show of this kind cannot be expected to compete from the artistic standpoint with some of those held for the general public which better lend themselves to unusual display effects, but the Knitting Arts Exhibition must rank well toward the top among industrial exhibitions of the same general size and character.

It is of course impossible to obtain accurate figures which allow a comparison between one Knitting Arts Exhibition and another of actual sales closed on the exhibition floor. Many exhibitors do not take space with the idea of doing business then and there, and make no attempt to do so. Yet it is the opinion of a number of important exhibitors among the trades supplying the knitting industry with equipment and materials that the Show just closed was the best in many years from the standpoint of sales made and in prospect as a result of their display.

Held under the joint sponsorship of the National Association of Hosiery Manufacturers and the Underwear Institute, the value of the Exhibition is of course enhanced by the annual conventions of both organizations held during the Show. It is also noted that more outerwear manufacturers are coming to the Exhibition, and that the number of exhibits designed to appeal particularly to them is increasing each year. The knitting industry has just witnessed another example of the sound institution it possesses in the Knitting Arts Exhibition, and the value such an annual event can have for alert, progressive manufacturers. The wet processors of the knitting field can feel themselves well repaid for their attendance.

BOOK REVIEW

The Aromatic Diazo-Compounds and Their Technical Applications by K. H. Saunders. 224 pages. Price $4.25. Published by Longmans, Green & Company, New York.

Great advances have recently been made in the chemistry and technical application of the diazo-compounds, and the present volume will be welcomed by all dyestuff chemists. In the Foreword, Prof. A. G. Green sets forth the great importance of diazo reaction as follows: "No other reaction in organic chemistry exhibits such an extraordinary versatility and generality as the diazo-reaction. No other series of chemical changes occur with such quantitative accuracy, ease and rapidity as those of which diazo-compounds are capable. In the field of dyestuff manufacture the diazo-reaction has afforded the means of preparing an endless array of coloring matters of all shades and the greatest variety of properties. At the present time over 80 per cent of the dyestuffs in commerce owe their formation, one way or another, to the diazo-reaction."

Mr. Saunders states in his preface that all of the papers and patents which have been published on the diazo-compounds would if brought together probably make a volume of some fifteen thousand pages, and that he has attempted to condense this mass of literature into two hundred and fifty pages, for the benefit of those who seek an introduction to this important field of organic chemistry. Many textile colorists who have used the quite recently developed Rapid Fast Dyes and Rapidogens, have been anxious to know more about their molecular structure. With the aid of this book, the student with a fundamental knowledge of organic chemistry may readily work out for himself an understanding of these new and very interesting color combinations. The whole book appears to be well arranged, and not filled with too many discouraging details. These are however available in approximately one thousand references.

This book should be in every dye chemist's library.

New Ways of Testing

Woolen and Worsted Lubricants

(Continued from page 246)

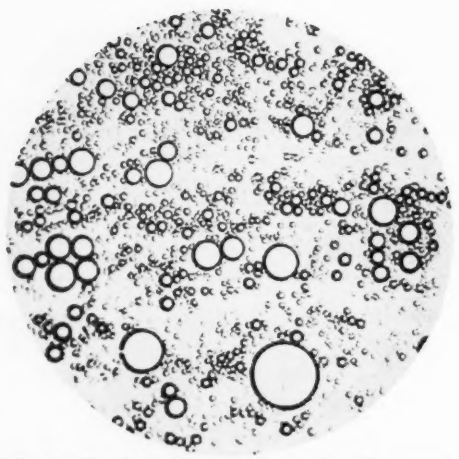


Fig. 2—Emulsion Showing Brownian Movement

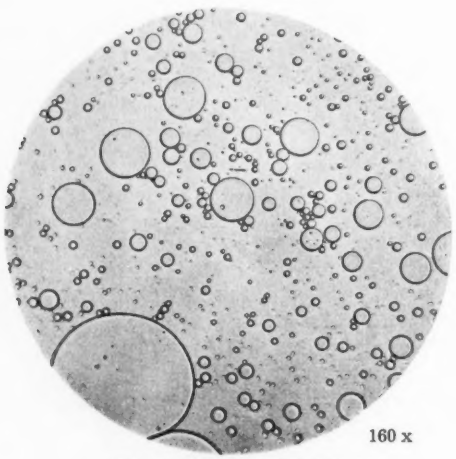


Fig. 3—Unstable Emulsion

customary to buy the oil and the emulsifying agents separate, and with the help of a stirring device, they produce their own emulsion. A few years ago several oil concerns introduced in the market emulsifiable oils which already have the emulsifying agent incorporated in them. As the emulsification of this type of oil is effected by simply stirring in water, they have actually simplified the preparing of stable emulsions. On the other hand, the mill man is left in the dark as to the quality of oil which forms the base of such a lubricant. Even with the advantage that such oils would have, many spinners are very skeptical against these kinds of oils, and their merit as proper lubricants.

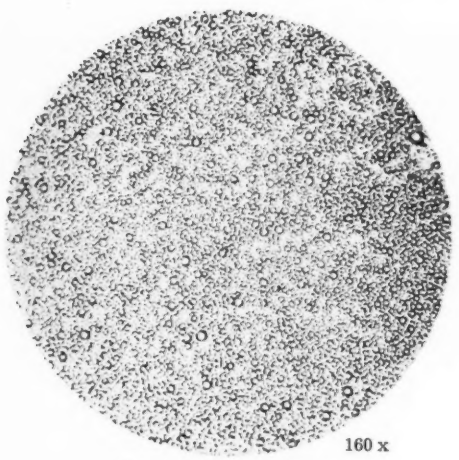


Fig. 4—Stable Emulsion

OILS USED

Now comes the question—what kinds of oils are best suited for woolen and worsted oiling and which are the characteristic properties? The three main factors governing the selection of wool oils are:

1. The efficiency as a lubricant and adhesive.
2. The oxidizing tendency and staining properties.
3. The ease by which it may be removed from the fabric by scouring with soap or soap and alkali.

Olive oil has proven to be by far the outstanding lubricant in this field, because it fully meets the above requirements. The only difficulty with olive oil is to get a uniform delivery and to get an oil with a low mucilage content. The Spanish olive oil was known to be the most uniform in this respect. In woolen spinning the cheaper animal oils are preferred, such as winter strained lard oil and red oils.

The substitutes for olive oil and the other vegetable and animal oils which are on the market today may be separated into three groups:

1. *The synthetic olive oils*: They are simply blends of various vegetable and animal oils of cheaper grades, which outwardly resemble on superficial inspection olive oil.

2. *Manufactured vegetable esters*: These are oils of vegetable origin, which underwent a special chemical treatment, such as distillation to purify them to a very high degree.

3. *Mineral oil lubricants*: They have as their main

base mineral oils of various grades from a dirty brown up to the water white type, which are mixed in connection with the emulsification agent with various vegetable and animal oils, some of them may be sulfonated.

TESTING

How is it possible for a mill man to select a proper substitute for olive oil? The way it is done today is as follows:

The first step is to have analysis made. The main tests on which the average mill chemist bases his judgment are the Mackay test and the Iodine number. In the Mackay test a good oil should not reach the 100° C. mark in 2 hours, but should stay below this mark. The main precaution which must be taken in the Mackay test is that a stainless steel or Monel metal wire basket must be used, as iron wire acts as a catalyst. Again this Mackay test is today no longer 100 per cent dependable, as the presence of certain compounds, like stannous salts described by Bertram* and beta naphthol have a retarding effect on the oxidation. The iodine number must be below 90. The color of an oil should be always above 10 (Tag Robinson Scale) as a dark oil will discolor a yarn even when the Mackay and Iodine numbers are perfect.

An oil containing a high percentage of vegetable mucilage must be discarded as it will cause trouble in spinning because of its stickiness. The cold point of a good worsted oil should be below 0° C. and a woolen oil below 10° C., otherwise on cold days it will be hard to start the carding and spinning machines (Table 1).

Through the analysis we have not gained any unobjectionable knowledge of the essential functions of these oils as wool lubricants. It is a necessity to make mill trials or laboratory tests, based on mill procedure.

MILL TRIALS

Mill trials are only worth while when carefully supervised, especially through a chemist. For proper comparison it is essential to run parallel tests, on the same wool blend, and do the carding and spinning on the same type of machines. After a test has proven successful on one blend, further tests must be made on various blends before a new oil can be generally adopted. The time needed before a final decision can be made about the usability of a wool oil is six months to a year. The work is best started with lots of about 100 lbs., then 1000 lbs., and finally quantities of 5000 to 10,000 lbs. are put through processing.

Which is the best way of performing lubricating tests, controlling them and drawing the final conclusion from the data obtained?

1. LUBRICATION

The two reasons for applying wool oils as mentioned previously is, first, to lubricate the fiber and minimize breakage in opening processes, such as woolen and worsted carding and rag pulling. Second, to increase the adhesion of wool fibers for one another, thus facilitating drafting. The carder and spinner will form his opinion about an oil from the yield of yarn he received, the amount of waste made, and the production efficiency of his machines.

From a research standpoint the lubrication power of

TABLE 1

No.	*1*	*2*	*3*	*4*	*5*
Type of Oil	*Olive Oil*	*Synthetic Olive Oil*	*Vegetable Ester*	*Mineral Oil I*	*Mineral Oil II*
Spec. Gravity	0.91	0.91	0.91	0.92	0.90
Color	12	12	16	14	9
Viscosity centipoise 20/21° C.	69	78	73	73	97
Mackay Test 2 hours °C.	95	106	97	96	95
Iodine No.	86	85	86	24	8
Saponification No.	190	186	191	15	2.5
Acidity	4.5	5.3	4.2	4.4	1.1
Coldpoint °C.	below 0° C.	below 0° C.	below 0° C.	below 0° C.	below 0° C.
Self Emulsifiable	no	no	no	yes	yes

The above analysis may serve as examples of oils, which are today on the market as wool lubricants. What can we learn through such analysis? The analysis gives us the main characteristic physical and chemical properties. The low Iodine and Saponification number proves the presence of mineral oil in oil 4 and 5. The Mackay test from oil 2 indicates, that the oxidation properties of this oil may be doubtful. Is this enough?

an oil is best judged according to Speakman by the extent of fiber breakage, which can be measured by the difference in length, between the original wool and the carded sliver or combed top. Samples are taken and tufts prepared of approximately 125 fibers in the manner recommended by Wilkinson and the length of the fibers in the tufts are measured either by hand method, or by means of an instrument (Sever fiber length measuring). Tests conducted at the University of Leeds on 64's merino wool proved that, in worsted carding and combing the number of short fibers is in direct relation to the quantity of oil

*S. H. Bertram: "The Retarding Effect of Stannous Salts on the Oxydation of Oleins and Oils"—*The Textile Manufacturer*, November, 1936.

used. A complete length analysis, the extent of fiber breakage can be expressed by stating the percentage by weight of fiber below a certain length. The table below gives some data from the test made in Leeds.

TABLE 2
Fiber Breakage in Worsted Carding

Regain of Wool		*Added Oil Per Cent by weight*	*Fibers below 65 mm. in carded sliver per cent by weight*
Feed	Delivery		
32.1	11.7	0.0	61.9
32.5	11.4	0.5	57.7
31.8	12.4	1.0	50.0

The addition of olive oil produces a striking reduction in the number of short fibers.

2. ADHESION

The adhesive power of an oil is especially essential to woolen carding to keep the short fibers in the loose roving together and facilitate subsequent spinning. By comparing the strengths of yarn produced by means of various oils and emulsions it is possible to obtain an indication of the relative efficiencies of the oils. The following results obtained in a mill test may illustrate the case:

	Oil A	*Oil B*
Count (Run System)	4.7	4.7
Moisture regain	11.2	12.2
Turns per inch	18	18
Strength grams	279	313
Elasticity %	11.2	13.7
Oil Content %	8.0	7.3

Oil B shows a slight advantage over Oil A. In working with longer wool, the tuft test is advisable also to study the fiber breakage, by observing carefully the evenness and roundness of the roving and by comparing the strengths of yarns produced.

3. OXIDATION OR AGEING

It is comparatively easy for the mill man to form his opinion about the lubricating properties of an oil on hand of his production data, and the condition of his yarns. We can say that most of the woolen and worsted lubricants on the market today are satisfactory in this respect, but what he is afraid of, is the change of the oil on the wool during the manufacturing process, and especially during storing. To check up this ageing process, which is caused by oxidation of the oil, when spread as a minute film over so large a surface area, (one pound of wool of an average fiber diameter of 20 microns, represents 80 square yards) is very difficult and time consuming.

The oxidizing tendency as measured by the Mackay test and the determination of Iodine value should be checked by the actual changes, which are taking place as soon as the oil is in contact with the fiber. In the oxidation of an oil, the fatty acid content increases in direct proportion. Based on this fact, the increase in the amount of the fatty acid in the oil on the wool over a period of several months is a good indication for the oxidizing property of oil.

The following procedure was followed by the author and found very satisfactory:

From each lot under test, 20 skeins of 10 gr. each are selected at random from 20 different cops from the fresh spun yarn. The skeins are stored in the yarn cellar and periodically analyzed. Two skeins are ether extracted using the A. S. T. M. procedure. After weighing the extract the oil is dissolved in 2 parts of ether and 1 part of alcohol and the fatty acid determined by titration with $\frac{N}{10}$ or $\frac{N}{100}$ caustic soda. Table No. 3 shows data gathered from a mill trial.

From this data we will note that it takes at least 90 days to get a clear picture of the oxidizing properties of an oil. Whereas the vegetable oils as well as animal oils are increasing in their fatty acid content right from the start in steps of 3 per cent or more, the low grade mineral oils oxidize very slowly in the first 60 days, but show quite an increase in their fatty acid content after 90 days. In the high grade mineral oils oxidation takes place in a similar manner to the vegetable oils. The higher amount of vegetable and animal oil in the mineral oil blend is responsible for that behavior.

A chemist is usually required to give his opinion about the suitability of an oil in a few days whereas the testing period necessary to get the story about the aging is of too great duration in our test. The author feels, as do many of his colleagues, the urgent need of a test method through which we would be able to duplicate the above result in a much shorter time. In my experience with oxidation of wool fibers through sunlight, which today can be duplicated more or less in the Fade-o-meter, the thought came to my mind that possibly the same thing can be done in testing the aging of oils. Preliminary tests conducted in the Fade-o-meter by exposing skeins were so convincing that further experiments were made. It was found that the exposure of skeins had too many handicaps as they cannot be evenly exposed. Therefore it was decided to use undyed cloth for this test.

The test procedure is as follows:

Approximately 100 grams of ready to dye broadcloth (10 to 12 oz.) is soaked in 400 cc. of ether containing 5 or 10 grams of the oil to be tested in a large porcelain dish. The cloth is worked by hand. It is put through a pair of squeeze rollers and air dried.

The piece is then divided into eight equal parts by just marking same with pencil lines across the width, after that one-quarter of the piece over the whole length is torn off and the eight parts marked on same are separated and each one analyzed separately for oil content and fatty acid. The rest of the piece is hung in the Fade-o-meter in circular form and to prevent the piece from moving and being scorched by coming in contact with the glass protective covering of the carbon points, weights are hung on the bottom of the piece. After 5, 10, 20 and 40 hours, two pieces are taken out of the Fade-o-meter and tested for

TABLE 3

Oxidation of Oils on Woolen Yarns. Mill Test

Test No. 1

Storing Time in Days	*Olive Oil*		*Vegetable Ester*		*Lard Oil Winter Strained*	
	Ether Extraction Per Cent	*Fatty Acid Per Cent*	*Ester Extraction Per Cent*	*Fatty Acid Per Cent*	*Ether Extraction Per Cent*	*Fatty Acid Per Cent*
2	8.7	9.4	7.3	9.5	7.6	10.1
15	8.2	11.1	7.4	12.3	8.1	12.9
30	8.3	15.1	7.5	13.3	7.6	13.2
60	8.4	17.9	7.9	17.6	7.6	16.5
Color of Yarn						
2 days	Slightly Cream		Slightly Cream		Slightly Cream	
90 days	Slightly Yellow		Slightly Yellow		Slightly Yellow	

Test No. 2

Storing Time in Days	*Olive Oil*		*Mineral Oil II Low Grade*		*Mineral Oil I High Grade*	
	Ether Extraction Per Cent	*Fatty Acid Per Cent*	*Ether Extraction Per Cent*	*Fatty Acid Per Cent*	*Ether Extraction Per Cent*	*Fatty Acid Per Cent*
2	7.7	8.5	7.2	6.1	6.1	10.0
15	7.5	10.1	7.2	7.7	6.0	15.0
30	7.9	14.5	7.3	8.6	5.9	17.1
60	8.2	17.8	7.5	9.3	5.9	17.8
90	8.2	23.8	7.0	14.4	6.0	21.0
1 Year	8.2	25.1			6.2	26.0
Color of Yarn						
2 days	Slightly Cream		Slightly Cream		Slightly Cream	
90 days	Slightly Yellow		Dirty tan visible after 30 days		Yellow	

oil content and fatty acid, as well as the change in color.

For the first test three oils were selected which possess striking differences in their physical and chemical properties: Olive Oil as a non-drying oil, Linseed Oil as the representative of the drying oil and an emulsifiable Mineral Oil.

In table number 4 the highly interesting data of these aging tests are gathered. Samples were treated with 10 per cent of the oils and the ether extract given at the start. 1, 2, 3 and 4 represent the variation in the oil content over the full width of the test piece and should be compared in their rotation with the change in the oil content of 5, 10, 20 and 40 hours. It is very difficult to have an even distribution of the oils over the whole piece, which accounts for the difference such as 7.9 per cent after 20 hours and 8.4 per cent after 40 hours in case of olive oil.

Nevertheless we can see a definite trend in the change of these oils. The olive oil lost 18 per cent of its original percentage, whereas the mineral oil shows a loss of 44 per cent and the linseed oil shows a loss of 77 per cent. The change in the fatty acid content is very remarkable. The olive oil shows an increase in fatty acid in 20 hours of 116 per cent and in 40 hours of 200 per cent whereas mineral oil shows only an increase of 147 per cent in 40

TABLE 4

Oxidation of Oils on Wool with Fade-o-meter.

	Spanish Olive Oil Per Cent		*High Grade Mineral Oil No. 1 Lubricant Per Cent*		*Linseed Oil Per Cent*	
Change in Ether Extract						
Start	1.	10.3	1.	9.3	1.	10.7
	2.	10.4	2.	7.4	2.	9.9
	3.	9.2	3.	8.7	3.	9.8
	4.	10.2	4.	8.5	4.	9.2
5 hours	1.	8.6		——	1.	5.6
10 hours	2.	9.0	2.	6.2	2.	3.9
20 hours	3.	7.9	3.	5.0	3.	2.4
40 hours	4.	8.4	4.	3.8	4.	2.1
Change of Fatty Acid						
Start	1-4	12.4	1-4	8.6	1-4	5.1
5 hours	1.	15.9	1.	——	1.	24.1
10 hours	2.	18.1	2.	12.3	2.	36.6
20 hours	3.	26.4	3.	16.3	3.	53.1
40 hours	4.	37.2	4.	21.1	4.	59.2

NOTE:—Each figure represents the average of two tests.

hours and the linseed oil shows an increase of 1060 per cent.

It was thought to overcome the un-evenness of the distribution of the oil content by working with samples of a lower oil content therefore the samples were treated with 5 per cent oils only. For this second series of tests in addition to olive oil and the mineral oil, red oil as a free fatty acid compound and a vegetable ester were put through the aging test. The data of the 4 oils are shown in table 5.

TABLE 5

Oxidation of Oils on Wool in Fade-o-meter

Change in Ether Extract

	Olive Oil Per Cent	*Distilled Red Oil Per Cent*	*Vegetable Ester Per Cent*	*High Grade Mineral Oil No. 1 Lubricant Per Cent*
Start	1. 4.96	1. 3.81	1. 4.83	1. 5.11
	2. 4.73	2. 5.10	2. 5.12	2. 4.75
	3. 5.15	3. 5.11	3. 5.42	3. 4.73
	4. 5.0	4. 4.58	4. 5.18	4. 4.86
5 hours	1. 4.74	1. 3.93	1. 4.77	1. 4.17
10 hours	2. 4.67	2. 4.72	2. 4.76	2. 3.70
20 hours	3. 4.83	3. 5.16	3. 5.08	3. 2.81
40 hours	4. 4.36	4. 3.97	4. 4.44	4. 2.15

Change of Fatty Acid

Start	1-4 9.52	1-4 90.7	1-4 8.62	1-4 8.0
5 hours	1. 16.0	1. 93.15	1. 9.98	1. 23.4
10 hours	2. 19.25	2. 96.05	2. 16.35	2. 30.4
20 hours	3. 22.15	3. 96.8	3. 19.45	3. 35.8
40 hours	4. 28.70	4.109.7	4. 29.15	4. 44.4

Of the 4 oils tested we find again this peculiar loss in the ether extract of oil during the exposure, which amounts to the following percentages:

Loss in Ether Extractable Matter	*Per Cent*	**The Increase in the Fatty Acid Amounted to:**	*Per Cent*
1. Olive Oil	12	1. Olive Oil	202
2. Red Oil	16.4	2. Red Oil	21
3. Vegetable Ester	11.3	3. Vegetable Ester	238
4. High Grade Mineral Oil	55.8	4. High Grade Mineral Oil	455

It is highly interesting to note that the red oil increased in its fatty acid over the 100 per cent mark, which proves that new compounds were formed of a different molecular weight than the original oleic acid.

By comparing this Fade-o-meter data with the data found in the mill trials we find no decrease in the ether extractable matter but we find the same increase in the fatty acid contents.

We find that 20 hours in the Fade-o-meter is equal in its oxidation to a 90 days test whereas the 40 hours exposure covers at least a period of a year. That means with this new method the goal which we set ourselves to reduce the testing time of at least 3 months down to a few days, was reached.

Another very astonishing discovery was made. Three oils of the self emulsifiable type with a known mineral oil content were exposed for 40 hours and the loss in weight in the ether extractable matter was for all three oils nearly equal to the total amount of mineral oil present in the original oil. The actual data are as follows:

	Per Cent	*Per Cent*	*Per Cent*
Mineral oil content at start	59.5	72	81
Loss in weight at 40 hours exposure	57	72	82

This indicates that the aging test may be worked out as a quantitative method for the determination of the mineral oil content in oils of this type.

(To be continued)

TECHNICAL NOTES FROM FOREIGN SOURCES

New Process for Dyeing Aniline Black

Dr. Justin-Mueller—TIBA 40, 341 (1936).—A critique of a Pli Cachete (No. 2,532) of the Societe Industrielle de Mulhouse, modifying an older procedure for dyeing aniline black, by addition of sodium nitrite to the padding bath.

The authors, MM. Sunder and Lantz, claim to accelerate the formation of the black by the use of amino-azobenzene as a carrier, and in a special way. Previous formulae have involved the use of this agent, added in the previously prepared state; but the present method generates it in the mixture by addition of nitrite to the slightly acid padding liquor, and warming until reaction has set in, which is the new point claimed.

The bath employed is composed as follows:—

12 parts of water
12 parts (approximately) of HCl of 20° B.
10 parts of aniline
1.3 parts of formic acid
0.05 parts of sodium nitrite in solution
1.2 parts of sal-ammoniac
10.2 parts of potassium ferrocyanide, dissolved in 30 parts of water
4.76 parts of sodium chlorate, dissolved in 20 parts of water.

The whole is diluted to 185 parts.

The same bath, without the nitrite, cannot exceed 145 to 148 parts, to attain the same depth of tone.

The bath must be acid to Congo paper before addition of the nitrite solution, which latter should be added at about 40° C., which temperature must be maintained until the cerise-red color formed has reached its maximum.

A single short passage through the Mather-Platt gives a good black, while with the ordinary bath (without nitrite, and 20 per cent stronger) would give in that time only a dirty green. It will be seen that, with such rapid development of the color, the loss and danger from escape of aniline vapor is greatly less.

The author (J.-M.) incidentally, in testing the above procedure, made some experiments involving the use of p-phenylene-diamine as an accelerator, a point which would seem to be involved in the action of p-amino-azobenzene as an accelerator; but found its action to be less rapid than in the above case.

The process is considered to form a distinct advance in the technique of aniline black dyeing.

Viscosity of Starch Pastes; Its Variation and Consequences

Cl. Wiedmer—TIBA 40, 103 *and* 167 (1936).—The paper takes up the following five general topics:

(a)—measurement of viscosity of starch pastes,
(b)—influence of acidity or alkalinity of the medium,
(c)—influence of addition of other substances,
(d)—influence of the nature of the starch employed, and
(e)—influence of previous treatments to which the starch has been subjected.

The various points are taken up in great detail and discussed carefully, with the addition of several tables of values determined. A clearly written, full, and valuable paper.

Surface-Tension of Fatty-Alcohol Condensation Products and Fatty-Alcohol Sulfuric Acid Esters

Prof. W. Weltzien and Dr. H. Ottensmeyer—Monats. f. Seide u. Kunstseide 40, 504 (1935).—A paper of purely scientific nature, and of value for a scientific understanding of some properties of this valuable group of products. The paper contains a cross-sectional illustration of the apparatus used in the authors' studies (it is a rarely good illustration, as such things go—unusually clear and comprehensive), and three graphs illustrating the authors' findings.

TRADE NOTES — NEW PRODUCTS

OBITUARY

F. T. BUSS

F. T. BUSS, Manager of Solvay Sales Corporation, St. Louis Office, died Sunday, April 18th, at the Barnes Hospital, following a major operation which was performed last month. He is survived by his wife and two daughters, Mary and Frances.

Mr. Buss was born in St. Louis, May 7, 1889 and was graduated from Washington University, St. Louis in 1910 with Bachelor of Arts Degree in Chemistry. He also studied medicine at the same college for one year, but did not complete the course.

From 1911 to 1916, Mr. Buss resided in Rochester, N. Y., being first employed as a research chemist at Eastman Kodak Co. and subsequently as manager of the Rochester Photo Works. He returned to St. Louis in 1916 to join the sales force of Whitelaw Brothers Chemical Co. In 1918 he received leave of absence to join the Chemical Warfare Service in Washington, D. C. He later returned to Whitelaw Brothers Chemical Co. In 1925 when that company was absorbed by Solvay Sales Corporation, Mr. Buss was appointed manager and retained that position until his death.

• M. I. T. SUMMER COURSE

Announcement has been made by the Department of Chemical Engineering of Massachusetts Institute of Technology, Cambridge, Mass., of the second special summer program in "Theoretical and Applied Colloid Chemistry" under the direction of Dr. E. A. Hauser. The program will consist of lectures, round-table discussions and laboratory discussions and is offered to men actively engaged in industry or in research organizations. The course will continue for five weeks, beginning June 14th. A bulletin regarding the course or special information may be obtained directly from Dr. Hauser, addressing him at the Institute.

• QUARTERLY PRICE LIST

The Quarterly Price List for April, 1937, has recently been distributed by the R & H Chemicals Dept., E. I. duPont deNemours & Co., Inc., Wilmington, Del. Copies are available upon request.

• GEIGY RELEASE

Geigy Company, Inc., 89 Barclay St., New York, announces release of a circular on the following new product:

Diphenyl Fast Brown 3 B L—for cotton and rayon. It is said to yield a true shade of brown with exceptionally good fastness to light. It is also said to have comparatively good fastness to water and washing, and to be not affected in shade to any extent under artificial light. It finds application not only as a self shade for brown but is also recommended by the manufacturers for securing various shades of tans where excellent fastness to light is essential.—Circular 275-D.

• GENERAL RELEASE

General Dyestuff Corp., 435 Hudson St., New York, announces release of a circular on the following new product:

Diazo Brilliant Scarlet 3 G — a new diazo color which, when developed with beta naphthol, produces a bright scarlet and with Developer Z A, a reddish orange said to be of very good fastness to washing and fairly good fastness to light. It is further said to give a clean white discharge with neutral and alkaline Rongalit C Paste. It is stated that cotton-rayon mixed goods are dyed a uniform shade. The new product is recommended by the manufacturers for dyeing pure silk as it is said to produce shades of very good fastness to water, washing and perspiration and of good fastness to milling.—Circular I.G. 1279.

• ELECTED DIRECTOR

Charles P. Gulick, of East Orange, president of the National Oil Products Co. of Harrison, N. J., was elected to the Board of Directors of the Harrison National Bank at its last meeting. Although he has been closely associated with the bank for many years, it is the first time he has had an opportunity to serve it directly as an officer.

• LAB TABLE TOPS

Stuart M. Phelps and Edward E. Marbaker of Mellon Institute have described the development of a new laboratory table-top material called "Kemite." Its properties are such that it is said to fulfill the exacting requirements of scientific laboratory service and does not have any of the disadvantages of the materials commonly used for this purpose.

Kemite consists essentially of an easily-moldable ceramic body into which has been incorporated carbonaceous substances to increase the porosity after firing. It also contains artificially-prepared cordierite, a mineral having an exceptionally low thermal expansion. This body, after molding, drying and firing, is completely

impregnated under pressure with liquid bitumens, and then subjected to a heat treatment during which the volatile matter is expelled. A residue of carbon in the form of coke fills the pores, rendering the body dense and imparting to it an attractive black color. Kemite is claimed to be smooth, hard, strong, practically impervious to liquids, and very resistant to the action of acids and alkalies. It is said that because of its low thermal expansion, when locally heated and cooled rapidly, it does not crack or spill. It retains its pleasing appearance under severe laboratory conditions.

While developed primarily as a tabletop material, the characteristics of Kemite suggest its use in other kinds of laboratory and chemical plant equipment. In another form called "Karcite," in which cordierite is not present, it is being used for sinks, tanks, drain pipe, pipe fittings, and window sills. In building construction, it can be employed in such forms as sanitary ware, partitions, roofing, flooring, wainscoting, stair treads, and shelves.

Other information about Kemite and Karcite may be obtained from Mellon Institute, Pittsburgh, Pa.

● CHINA'S CHEMICAL TRADE

China, with the exception of certain drying oils, is preeminently an import chemical field, though the foundation of an independent chemical industry has been laid, and considerable progress along certain lines has already been recorded, according to reports from Trade Commissioner A. V. Smith, Shanghai, made public by the Commerce Department's Chemical Division.

Rapid modernization of the country is the key factor in the present outlook for China's chemical trade, creating as it does a widening demand for various imported lines, the report states.

China's import demand for chemicals and related products lagged somewhat last year, judging from official statistics, though the recorded loss may have been offset by goods smuggled into the country. Considerable quantities of dyes, medicines, alcohol and other lines were brought into the North China area in this manner, and of course are unrecorded, it was stated.

Various industrial plants in course of erection or expansion in 1935 were completed last year and the Ministry of Industry reported that 116 new small factories and workshops were established by private interests.

● REVERTEX EXHIBIT

At the Paris International Exhibition during the summer of 1937 the Revertex Corporation of America, together with the Revertex sales agencies in other parts of the world, will exhibit Textiles processed with Revertex, molded goods as well as other products in whose manufacture Revertex was used.

Stand S.15 in the Palais du Caoutchouc, Cours la Reine, near the Place de la Concorde, has been engaged for the Revertex exhibit.

● "AMERICO" TEXTILE PRODUCTS

The American Laboratories, Inc., 99-101 Redmond St., New Brunswick, N. J., announce the availability of a full line of "Americo" textile products for bleaching, dyeing, finishing and printing.

The manufacturers stress high sulfonation, concentration and uniformity in "Americo" products, which they claim are responsible for the beneficial results and minimum production costs reported by many mills.

The American Laboratories, Inc., offer to textile mills the services of technical field representatives to demonstrate or assist in overcoming mill problems. Samples of any products are available on request.

● OPENS CLEVELAND OFFICE

W. I. Galliher, Director of Sales, The Columbia Alkali Corporation, announces the appointment of Mr. A. E. Shaw as District Sales Manager of Northern Ohio with offices at 3849 Hamilton Avenue, Cleveland, Ohio.

Mr. Shaw has devoted his time since 1919 to selling, having held several responsible positions before joining the Columbia organization in 1932. During the past few years Mr. Shaw has devoted considerable time to promotional efforts on Calcium Chloride and more recently to the distribution of Columbia's full line of products.

● NOPCO EARNINGS

A rise of more than 33 cents per share in the earnings of the National Oil Products Company of Harrison, N. J., for the first quarter of 1937 as compared to the same period last year was indicated recently by Charles P. Gulick, president, in a statement after the April meeting of the Board of Directors.

● DEDICATION AT MELLON INSTITUTE

The names of internationally-known scientists who will take part in the program of Mellon Institute when its new building is dedicated May 5-9 were announced recently by Dr. Edward R. Weidlein, Director of the Institute.

They include four Nobel laureates, as well as other nationally recognized figures in chemistry, other sciences, and medicine.

At the formal dedication of the building in the afternoon of May 6 in Carnegie Music Hall, with Dr. Weidlein presiding, addresses will be given by three Nobel prize-winners—Dr. Irving Langmuir (chemistry), Dr. H. C. Urey (physical chemistry), and Dr. W. P. Murphy (medicine). Brief addreses will be given at this event by Andrew W. Mellon and Richard K. Mellon, representing the Founders.

The Trustees' dinner will be held in the evening of the same day, among the speakers being Dr. Benjamin T. Brooks, Dr. Karl T. Compton, and Dr. F. C. Whitmore. A. V. Davis, chairman of the board of the Aluminum Company of America, will be toastmaster. Trustees of the Institute comprise John G. Bowman, president, Dr. Weidlein, vice-president, Henry A. Phillips, secretary-treasurer, Andrew W. Mellon, and Richard K. Mellon.

The third outstanding scientific event of the dedicatory ceremonies will be the Symposium on Recent Progress in Science, scheduled for the morning of Friday, May 7, in Carnegie Music Hall. Speakers will include Dr. G. O. Curme, Jr., Dr. F. B. Jewett, Sir Frederick Banting, and Dr. W. W. G. Maclachlan.

The new building of Mellon Institute, which has taken six years to complete, is to be dedicated to science and humanity in honor of Andrew W. and Richard B. Mellon, founders of the institution, who in 1911 gave support to the research fellowship system advanced by the late Robert Kennedy Duncan by establishing a specific department at the University of Pittsburgh and in 1913 placed the system on a permanent basis with the organization of Mellon Institute.

Visitors from many parts of the world are expected to attend the exercises because of the high position which the Institute has won in pure and applied research and because of the unusual character of its new home, which clothes in classic beauty a modern workshop of science in which many features of construction and equipment have been the result of exhaustive experimental research.

First announcement of the detailed program for the dedicatory week also was made by Dr. Weidlein. This program follows:

Thursday, May 6, 9 a.m., assembly of out-of-town guests at the Institute's new building; 10 a.m., preview of the building for former fellows, past and present research donors, and other guests; 12 m., luncheon for visiting scientists, Hotel Schenley, and luncheon sponsored by the Robert Kennedy Duncan Club for former fellows, University Club; 2 p.m., dedication exercises, Carnegie Music Hall; Trustees' dinner, 7:30 p.m., William Penn Hotel.

Friday, May 7, 10 a.m., Symposium on Recent Progress of Science, Carnegie Music Hall; 12:30 p.m., luncheon for visiting scientists, University Club; 2:30 p.m., special meeting of Robert Kennedy Duncan Club, Institute Auditorium, and inspection of the new building and special exhibits; 7 p.m., group dinners for visiting scientists.

The new building will be open to the public Saturday, May 8, from 10 a.m. to 10 p.m., and Sunday, May 9, from 1 to 7 p.m.

• CIBA RELEASES

Ciba Company, Inc., Greenwich and Morton Sts., New York, representing the Society of Chemical Industry in Basle, has just issued circulars on the following products:

Alizarine Sapphire Blue BBR (pat. applied for)—recommended by the manufacturers for the dyeing of wool yarns and pieces and particularly for combination with other acid dyestuffs of good fastness to light. In dyeing mixed fabrics, it is claimed that cotton, rayon and acetate fibers are reserved. Alizarine Sapphire Blue BBR has a wide field of usefulness in silk dyeing, as it is said to be equally well adapted for either pure-dye or weighted silk, in either piece goods or skeins. This new type is not suited for printing either cotton or silk nor is it suited for discharge printing.—Circular No. 456.

Chlorantine Fast Orange T5RLL patented—a new type which shows on all materials the same properties as the older type, Chlorantine Fast Orange T4RLL, but dyes a redder shade. This new product is recommended by the manufacturers especially for drapery and upholstery fabrics. With goods made of cotton and rayon, both fibers are said to be dyed fairly uniformly, but acetate fibers remain reserved. Chlorantine Fast Orange T5RLL is not recommended for dyeing unweighted silk; in half-silk fabrics dyed in a faintly alkaline bath, the silk is reserved. In union dyeing Chlorantine Fast Orange T5RLL is said to be well suited for cotton printing or for discharge.—Circular No. 457.

Brilliant Alizarine Fast Blue B—a new acid wool dyestuff which is said to be remarkable for its particularly clear shade and good fastness to light. Its fastness properties closely resemble those of Alizarine Fast Blue BB. Brilliant Alizarine Fast Blue B is recommended by the manufacturers for all branches of wool dyeing, yarn and pieces, effect threads and carpet yarns, as well as for goods requiring a light milling. On account of its resistance to chroming, it may be used in combination with the Chrome Fast colors. In mixed fabrics, rayon, acetate and cotton are said to remain pure white. Brilliant Alizarine Fast Blue B is said to exhaust very well from a neutral Glauber's salt bath on to the wool and is suitable for use in combination with Chlorantine Fast Blues for the dyeing of blue shades, fast to light, on unions and wool-rayon staple fabrics. In silk dyeing, it is said to be well suited for either pure-dye or weighted silk, being dyed in either an acid or broken soap bath.—Circular No. 458.

Cibacete Red B patented—a pure ruby shade on acetate fibers, said to have very good fastness to light. It is bluer than the well known types of Cibacete Reds GR and GGR. The fastness to light is stated to be excellent, even on pigment-delustered acetate fiber. The fastness to washing, water, perspiration and acids is said to meet the requirements for most acetate materials. The exhaust and appearance in artificial light are said to be both very good. In combination with the other Cibacete colors, one may produce all the current shades of bloomy reds, bordeaux and ruby tones, as well as fashionable shades. It is stated that cotton and rayon in mixed fabrics are somewhat tinted, but may easily be cleared by the common methods, as may also wool and silk. Cibacete Red B is claimed to be dischargeable to a pure white.—Circular No. 459.

Kiton Fast Red 2BLE patented—a very level dyeing, new acid red for wool. Its tone is somewhat bluer than the well known Kiton Fast Red BL and its fastness to light is designated as good to very good. This new product is recommended by the manufacturers for dyeing wool yarns and pieces, both as a self shade and for combinations having the best levelness and fastness to light. It is claimed that by continued boiling there is neither a dulling of the shade nor a boiling-off of the dyestuff. Effect threads of cotton are slightly tinted, but acetate and rayon are unstained. Kiton Fast Red 2BLE is not suited for neutral dyeing on unions. With wool-silk mixed fabrics, dyeing in a sulfuric acid bath, the silk will remain considerably lighter. On account of its good solubility, this new dyestuff is said to be well suited for application prints on wool and its dyeings to be dischargeable.—Circular No. 460.

Ciba Red 2B—a vat dye giving shades somewhat purer and yellower than Ciba Red 3BN and said to be distinguished by very good fastness to washing chlorine, good fastness to soda boil and good levelling. The new dyestuff is recommended by the manufacturers for dyeing loose cotton, yarn in packages, beams and for piece dyeing, also for fancy woven goods bleached in the piece. Rayons of unequal affinity are said to be dyed uniformly. Ciba Red 2B is said to be suitable for natural silk and yields dyeings fast to boil-off. In printing, this new type is recommended by the manufacturers for direct printing on cotton, rayon and silk and for color discharges on cotton and rayon.—Circular No. 462.

Ciba Violet 4B patented—a further addition to the Ciba line of vat dyes, recommended by the manufacturers for a variety of purposes in the dyeing and printing of cotton, rayon and natural silk. All the fastness properties are said to rate from good to very good. Dyeings on cotton or rayon are claimed to be dischargeable to a pure white by the use of Hydrosulphite RA Ciba and Discharge Salt Ciba W.—Circular No. 463.

Chlorantine Fast Yellow SL—somewhat redder and yet clearer than the RL type, but is said to be noted for a better reserve of acetate and natural silk. It is intended for use in the dyeing of yarns and pieces made of cotton, viscose and cuprammonium in cases where good fastness to light is the first consideration. It is claimed that rayons of unequal dyeing affinities are dyed level and that acetate effects, even on large stripes, are perfectly reserved. Chlorantine Fast Yellow SL dyes unweighted silk from an acid bath. On half-silk goods, dyed in an acetic acid bath, silk is dyed considerably deeper than cotton. In dyeing half-wool unions at 140° F. this new product is claimed to scarcely draw on the wool, but very well on the cotton, so that it is especially adapted for filling the shade of the cotton. By an aftertreatment with Sapamine KW, it is claimed that the shade becomes clearer, the fastness to acid boiling and water greatly improved and the fastness to light scarcely affected. Dyeings on cotton and rayon may be discharged to a pure white with a neutral discharge paste.—Circular No. 464.

Ciba Brown BB Micro Paste patented—a new addition to the line of Ciba vat dyes, especially adapted for the printing of cotton, rayon and silk. This new type gives prints on cotton of a blacker tone than Ciba Brown G and therefore is better suited for the production of deep browns. Combinations with Ciba Brown G, Ciba Orange R, etc., will permit the production of all the current shades of brown. The fastness properties are said to range from good to very good, so that Ciba Brown BB Micro Paste is recommended by the manufacturers for upholstery goods, dress materials and shirtings. Very smooth prints are said to be obtained on viscose fabrics, also on mixed fiber fabrics of cotton and rayons. It is claimed that the dyeings are dischargeable to a pure white. This new dyestuff may also be used in the dyeing of cotton or rayon yarns and pieces.—Circular No. 465.

OPEN FORUM

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the Reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Answer

40—Can creases in knit goods for underwear be eliminated? The fabric is kier boiled in a vomit kier for twelve hours under twelve pounds pressure, then given a hypochlorite bleach and finished by passing through a mangle.

These creases appear before going through the mangle, and the mangle does not press them out. Information or suggestions will be appreciated.—**W. H. F.**

Answer No. 2—I used a ton Allen Kier with circulating pumps and four vomit pipes, after my change in procedure the results were very good.

Instead of 2,000 pounds of material, I cut the load to 1,200 pounds, cut the pressure from 15 pounds to eight pounds, and replaced part of the caustic soda with soda ash and added a good oil detergent, this kept the material in a soft condition, the time was cut from eight to four hours.

I also noted that loading the kier evenly, and not packed down with foot pressure greatly helped the trouble.

After the alkali boil, wash the material with hot water, if possible from the bottom, until nearly all alkali is washed out, then cool with cold water.—G. H. D.

Unanswered Question

41—We would like to know the general principles of the process used in rendering silk transparent. Inasmuch as the process is to be used on rather heavy goods, we believe that one of the newer methods whereby thin layers of fiber have been rendered absolutely transparent is necessary. Information along this line which any of your readers are inclined to give will be highly appreciated.—**Library.**

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: Chemist capable to take charge or supervise the preparation, dyeing and finishing of rayon, acetates, cross-dyes,—Special experience in crepes—Cotton experience and original research work. Write Box No. 945, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

CHEMIST WANTED: Well known sulfonated oil manufacturer has an opportunity for a chemist possessing necessary experience and knowledge of mineral oils for lubrication and emulsions for textile trade. Write stating age, education, experience and salary expected. Box No. 947, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED—Mill chemist for dye and finishing plant handling rayon, worsted, and acetate piece goods. State age, experience, education, salary expected. Write Box No. 950, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

Salesman with office and storeroom in Chicago, would represent dyestuff and chemical manufacturer. Long following in middle West. Commission and small part expense. Write Box No. 951, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Sulfonator with twelve years' experience in the manufacture of textile and leather oils desires new connection. Write Box No. 953, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Acetate dyestuff salesman with following in the Paterson, New Jersey, district. Write Box No. 954, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Textile Chemist and Colorist. 25 years' experience in the testing and application of Azo, Sulfur and Acetate dyes. Qualified for color matching and standardizing. 15 years in charge of standardizing for dyestuffs manufacturer. Age 39 years, married. Will go anywhere. Write Box No. 955, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.